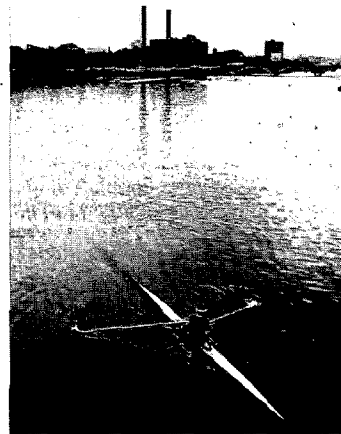


Report of the Southeastern New England Study



a Strategy for Balanced Development
and Protection of Water and Related
Land Resources in Eastern
Massachusetts and Rhode Island

SUMMARY

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New England River Basins Commission

New England River Basins Commission

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The Southeastern New England Study (SENE) is a "level B water and related land resources study." It was conducted under the provisions of the federal Water Resources Planning Act of 1965. The resources management program the Study produced was developed by a team of federal, state, and regional officials, local citizens, and the scientific community, under the overall coordination of the New England River Basins Commission. It is a part of the Commission's comprehensive, coordinated joint plan for the water and related land resources of New England.

The recommended program for managing the resources of Southeastern New England is described, in increasing level of detail, in the following Final Reports:

A SUMMARY highlighting the principal findings and recommendations of the Study, and their implications for the future of the region.

A REGIONAL REPORT and Environmental Statement describing *in detail* the natural resources, issues and problems facing the region, the alternative solutions examined during the Study, the recommendations made, and their implications. It includes policies and programs for dealing with water supply, land use, water quality, outdoor recreation, marine resources, flood and erosion protection, and key facilities siting, and the changes in state and local government required to implement the program.

Ten PLANNING AREA REPORTS dealing with the same subjects as the Regional Report, but aimed at the local level. Eastern Massachusetts and Rhode Island were divided into ten "planning areas" based either on traditional sub-state divisions or principal river basins. Reports were prepared for the following areas:

1. Ipswich-North Shore,
2. Boston Metropolitan,
3. South Shore,
4. Cape Cod and the Islands,
5. Buzzards Bay,
6. Taunton,
7. Blackstone and Vicinity,
8. Pawtuxet,
9. Narragansett Bay and Block Island,
10. Pawcatuck

Other reports prepared during the course of the Study include the following:

Inventory Reports

For each of the ten planning areas, inventory reports were prepared covering the following subjects: climate, meteorology, hydrology, geology; land use, patterns, allocations, and management; special environmental factors; water supply; ground water management; water quality control; outdoor recreation; fish and wildlife; navigation; flood plain zoning and streamflow management; inland wetlands management; coastal resources; irrigation and drainage; sediment and erosion; power; minerals.

Special Reports

In addition to inventory reports, over a dozen special reports were prepared, including: Socio-Economic and Environmental Base Study, Volumes I and II; Economic analyses of water supply and demand issues, power plant siting, coastal resources allocation, and sand and gravel mining; Legal and institutional analyses of the state wetlands laws, arrangements for water supply service, fiscal policy and land control, access to natural resources areas, and management structure for water and land use issues; Urban Waters Special Study; Summaries of public workshops

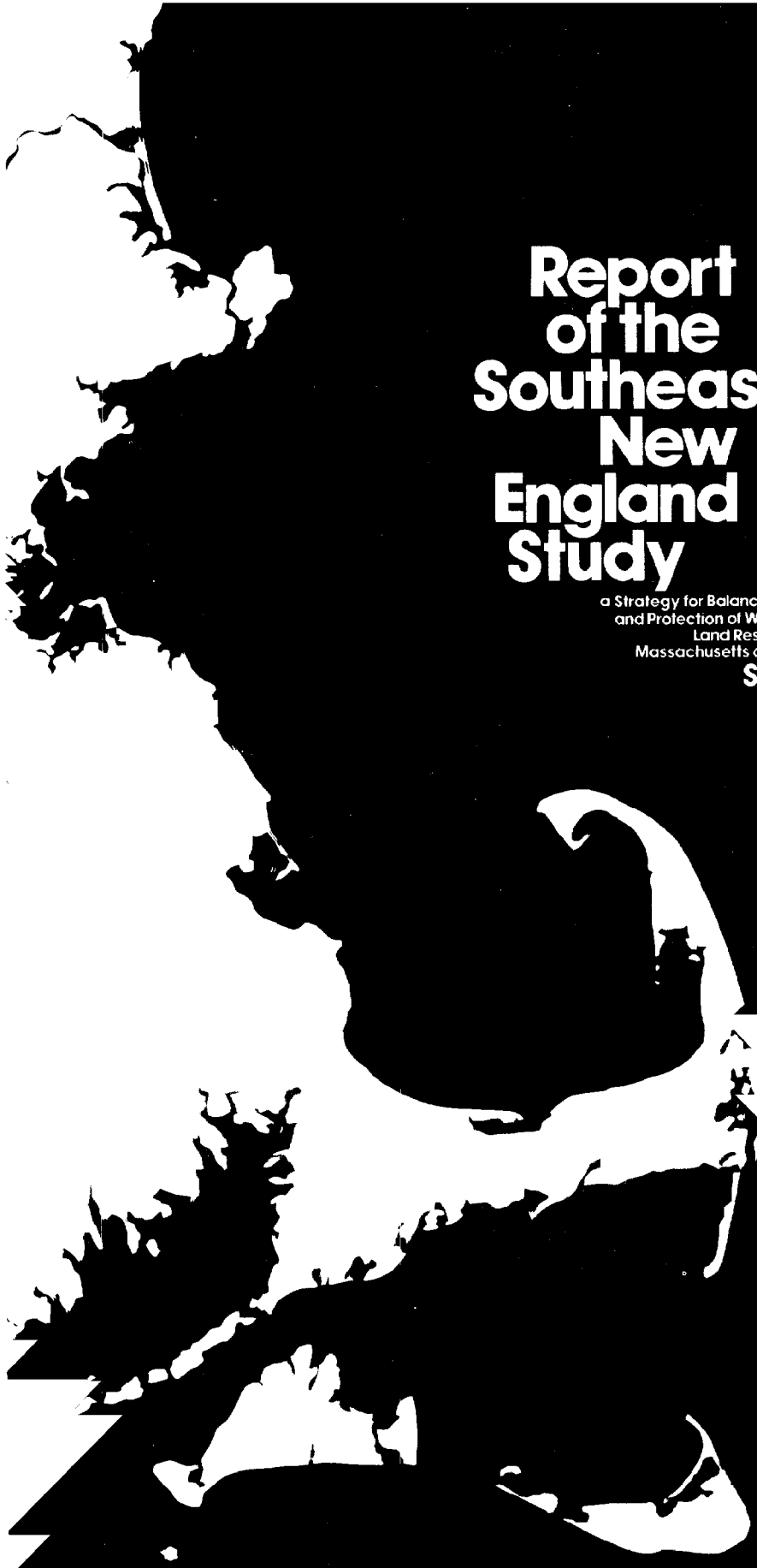
Copies of reports are available from:

New England River Basins Commission
55 Court Street
Boston, Massachusetts 02108

National Technical Information
Service
Springfield, Virginia 22151

and also in each of the 208 libraries and 210 town halls throughout the SENE region.





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SUMMARY

New England River Basins Commission
December, 1975

To Their Excellencies, the Governors of Massachusetts and Rhode Island; to the Water Resources Council for transmittal to the Congress through the President of the United States; and to the people of Southeastern New England:

The water and related land resources of Southeastern New England serve over five million people in eastern Massachusetts and Rhode Island with one of the most attractive landscapes for living of any urban region in the world.

These resources are under intense pressure. The future will bring additional stress as population grows and the region seeks the expanded economic base it needs to provide a decent standard of living for all its citizens.

Fortunately, the needs of the foreseeable future *can* be met without degrading the special quality of this environment—if patterns of growth respect the capabilities of land and water resources, and if resource systems of special value and vulnerability are vigorously protected.

This report outlines a strategy for accommodating and helping guide growth in ways consistent with wise use of natural resources, and recommends policies, programs and specific actions to develop, protect and enhance these resources to meet a wide range of human needs.



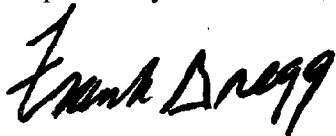
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The report represents the diligent labor of over 250 individuals, both private citizens and public officials working at local, state and federal levels for the management of our resources. Many of the solutions they have proposed can be carried out immediately; still others will require changes in laws or custom or funding levels. The participants did not always agree, but to an unprecedented degree this document represents a consensus. We are deeply grateful to all.

Southeastern New England is, to put it simply, a good place to live and work. The resources management strategy offered in this report is designed to help keep it that way.

Respectfully submitted,



R. Frank Gregg, Chairman
New England River Basins
Commission

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**“Can we accommodate growth,
provide adequate economic op-
portunities and still protect the
amenities which make SENE
such an attractive place to live?
The Study says yes. . .”**

The Key Findings

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The southeastern corner of New England, consisting of 213 communities in Rhode Island and eastern Massachusetts and Southeastern Connecticut, today is home to nearly 50 percent of New England's population on barely 7 percent of its lands.

Southeastern New England (SENE) is a kind of urban frontier—a transition zone between the dense press of people, commerce, and industry characteristic of the Northeast Megalopolis and the small cities and towns, open salt marshes, agricultural and forested lands characteristic of much of New England. The rich variety of this landscape has attracted millions of visitors to the region, and thousands have stayed on as residents.

The goal of the Southeastern New England Study was to find ways to accommodate the sometimes conflicting demands for conservation and growth.

There is every likelihood that this growth will continue, although it will probably taper off by the turn of the century. The central question facing the people of Massachusetts and Rhode Island is:

Can we accommodate growth, provide adequate economic opportunities, and still protect the amenity values of the region's resources which make SENE such an attractive place in which to live?

The conclusion of the Southeastern New England Study is that *we can*. There is room for this growth. But, if the *patterns* of growth continue as they have in the past decade, the natural resource amenities which stimulated it in the first place will be destroyed. There will be real, even agonizing, local conflicts over specific uses of certain resources. And a degree of control over certain types of development and the use of certain fragile resources will be necessary. But, overall, we have both the land and the technical and political means to provide both sites and resources for job-producing economic activities and still have an attractive environment in which to live. Moreover, it may well be that we can guide this growth in a way which increases the efficiency of public investments in water, sewer, transportation, and other facilities.

Three key findings support this conclusion: **Enhancing The Environment Enhances The Region's Economy.** The export of services—education, medicine, research, and development—is rapidly becoming the dominant economic activity of the region. It is expected to outstrip manufacturing well before 1990. In light of the economic climate of SENE, this trend is not surprising. The region is remote from raw materials, its transportation links are inadequate for many industries, and the cost of energy and labor is high. The transition from manufacturing to a service-oriented economy has not been a smooth one. Major dislocations have occurred in both Massachusetts and Rhode Island, and these will probably continue.

Despite its relative decline, manufacturing is still an important economic activity in the region; and efforts are underway to attract new light manufacturing industries to lessen the impact of the dominance of services on the region's manufacturing work force. The trend to services and certain light manufacturing activities has clear implications for the region's resources. These businesses, with their national markets, are free to locate anywhere in the country. Yet they choose to locate in SENE. One of the important reasons they do so is that the region's exceedingly attractive living environment helps them draw and keep the labor they require. As a result, efforts to enhance the environment serve to enhance the region's economy as well.

The region's amenities are a competitive economic advantage today, as water power and ports were in the past.

Anticipated Growth Can Be Accommodated But Should Be Guided To Protect Fragile Resources And Make Development More Efficient. The Study has found that even if Critical Environmental Areas are protected, enough legitimately developable land exists to meet the region's development requirements, not only in the near future but through the year 2020. This is true even if development continues to consume land at the 1960's rate of one-half acre per person—a rate four times higher than the historical average for Southeastern New England. But experience tells us that development will not always occur in the most suitable places.

In order to reduce the negative effects of growth, new development must be guided to lands which can support development. And to decrease the cost of growth to local taxpayers, new development should be guided to those areas already served by essential water, sewer, and transportation services, whenever possible.

To ensure that the region's dual needs for economic growth and a decent living environment are satisfied, a comprehensive development policy is badly needed. The SENE Study provides a detailed analysis of the development capability of the region's water and related land areas and is an important step toward developing such a policy.

Existing Knowledge, Programs, And Institutions Can Provide The Tools For Achieving Results, But Some Changes Are Needed. The Study concludes that natural systems can accommodate projected growth. However, some changes are needed in the resource management tools used by the two states to implement the recommendations of the Southeastern New England Study.

At the same time, however, the Study recognizes that resource decisions are made daily in town halls through conservation commissions, planning boards, and zoning boards of appeal. Often, however, these decisions have spawned development patterns which have been costly to serve with municipal services and which have had unforeseen impacts on surrounding communities. There has been a failure to recognize land development capability in planning and making decisions about land use.

To guide growth more effectively, some realignment of the traditional roles of each level of government will be required. Municipalities should continue to make the bulk of land use decisions because they are of local significance. For those development decisions which, because of their size or effect on certain critical resources, will affect more than one community, a regional or state perspective will be needed. The state's role should be to set broad policy, arbitrate conflicts, and provide financial and technical help.

The political reality of broad state responsibility tempered by the strong tradition of local autonomy sharply influenced which solutions to resource problems were chosen from many possible approaches, and which actors were best suited to carry them out. The Study offers several alternatives for an institutional realignment. The final decision must be made by each state acting through its legislature.

Guiding Growth

The region is urbanizing at an incredible rate. However, it appears that we can protect Critical Environmental Areas and still have enough land suitable for development to meet our needs. State development policies and comprehensive land use programs are badly needed to guide and shape that growth.



In an area as densely populated as SENE, the competition for prime land among commercial, residential, and recreational interests is intense. The result of this competition is compelling evidence of the need for better programs to guide future growth. The SENE Study provides one such program.



The Situation. Between 1960 and 1970, the population of Southeastern New England increased from 4.4 million to 4.8 million—roughly 8 percent. Under the most conservative estimates, almost one million more can be expected by 1990. The gross rate of land consumption in the sixties—one half acre per person—was four times higher than the historical average of the region. In the same decade, the area of SENE covered by urban development increased by about 45 percent, increasing from 15 to 21 percent of the region's total land area, and consuming 28 percent of the region's agricultural lands, 9 percent of its open wetlands, and 5 percent of its forests. Low density urban sprawl increased 68 percent.

One third of the region is already urbanized or in public ownership. Another third is composed of lands which are either too fragile to support any development or which pose a hazard to public safety if developed. Included within this third are inland water bodies, wetlands, estuaries, flood plains, and prime agricultural lands. The remaining third is suitable for new development and, *with appropriate guidelines*, can fully meet the region's development needs through 2020, even if land continues to be consumed at the high rate of the sixties.

Rhode Island has established a state growth policy and a state land use plan. Massachusetts is currently investigating several different options for exerting more effective leadership in the management of growth.

A study of community growth patterns sponsored by the President's Council on Environmental Quality indicates that there are significant economic, as well as environmental, advantages to encouraging clustered development in areas served, or to be served, by "infrastructure," such as water, sewer, and transportation facilities. In point of fact, infrastructure in many areas of SENE is "over-planned"—that is, there are more sewer facilities in place or proposed than the population projections indicate may be needed. (See chart.) In other areas, facilities are already inadequate.

Excess capacity in sewer facilities already planned for 1990 could serve all the population projected for that time, if growth were guided to those areas. A strengthened relationship between development and infrastructure would also allow use of infrastructure investment policy to facilitate emergence of, and carry out, public growth policy.

The Solutions. The region badly needs a system for allocating land uses to meet the projected population on the diminishing amount of available land, in such a way that economic opportunities as well as environmental quality will be enhanced.

These actions are of regional significance and beyond the scope of local jurisdictions.

Because of this, state assistance is needed and the states will have to reassert some of the authority previously delegated to municipalities. Opportunities for doing so are presented in Strengthening the Management System for Natural Resources, page 29. Meanwhile, most of the following recommendations can be accomplished by concerted actions on the part of local planning boards, zoning boards of appeal, conservation commissions, local health officials, and building inspectors.

1. Protect Critical Environmental Areas.

Areas which are too fragile to support any development, or whose development might constitute a hazard to public health and safety, should be protected. These areas constitute the region's Critical Environmental Areas and include water bodies, well sites, inland and coastal wetlands, critical erosion areas, beaches, flood plains, prime agricultural lands (for non-forest and forest production), coastal flood hazard areas, and unique natural and cultural sites.

2. Manage Areas Suitable for Development.

Land uses and densities of development should be carefully managed on those lands suitable for varying degrees of development. These lands,

the Developable Areas, include aquifer recharge areas, best wildlife habitat, high landscape quality areas, ledge, steep slopes, and septic system limitation areas. The region's future growth must be guided to these lands according to their capacity to sustain it. Within the recommendation of managing developable lands, a number of significant opportunities exist for increasing public investment efficiency in meeting the needs of growth. They include:

- guiding growth to areas already served by infrastructure such as water, sewer, and transportation facilities. The provision of such services should become a determinant of growth patterns, not a reaction to them. Major public investment savings can be achieved by maximum use of existing services.
- clustering and other higher intensity land uses. Recently released federal figures show that savings of up to 50 percent are achievable in energy, water, sewer service, and transportation needs under clustering. While sufficient developable land for continued sprawl exists, the Study suggests that it may no longer be responsible, either fiscally or environmentally, to encourage such development.

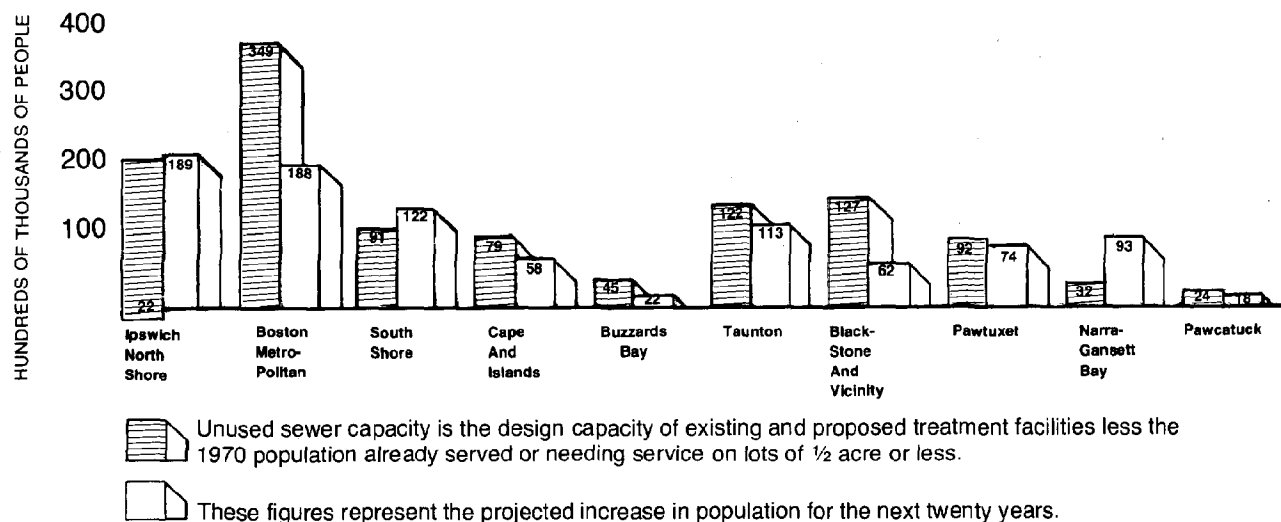
3. Regulate Developments of Regional Impact.

The states should control the location of developments of key facilities—power plants, petroleum facilities, airports—necessary for continued growth but a potential hazard to the region's resources, by regionally agreed upon siting criteria. Sites meeting criteria for such facilities should be considered as valuable as Critical Environmental Areas and secured and protected from preemption. Criteria should also be established for the location of large-scale, or growth-inducing, developments such as shopping centers and highway interchanges.

Implications. The relative abundance of land suitable for development in the region provides a great opportunity to assure adequate growth opportunities without sacrificing the region's environmental amenities. Directing future growth will require close cooperation between the state and local officials and developers who have traditionally held the responsibility for development decisions.

Varying development patterns and densities which respect land and water capability, along with clustering and judicious expansion of water-related infrastructure—water supplies and sewerage—can become valuable tools for directing growth in the most public investment—and resource—efficient manner possible.

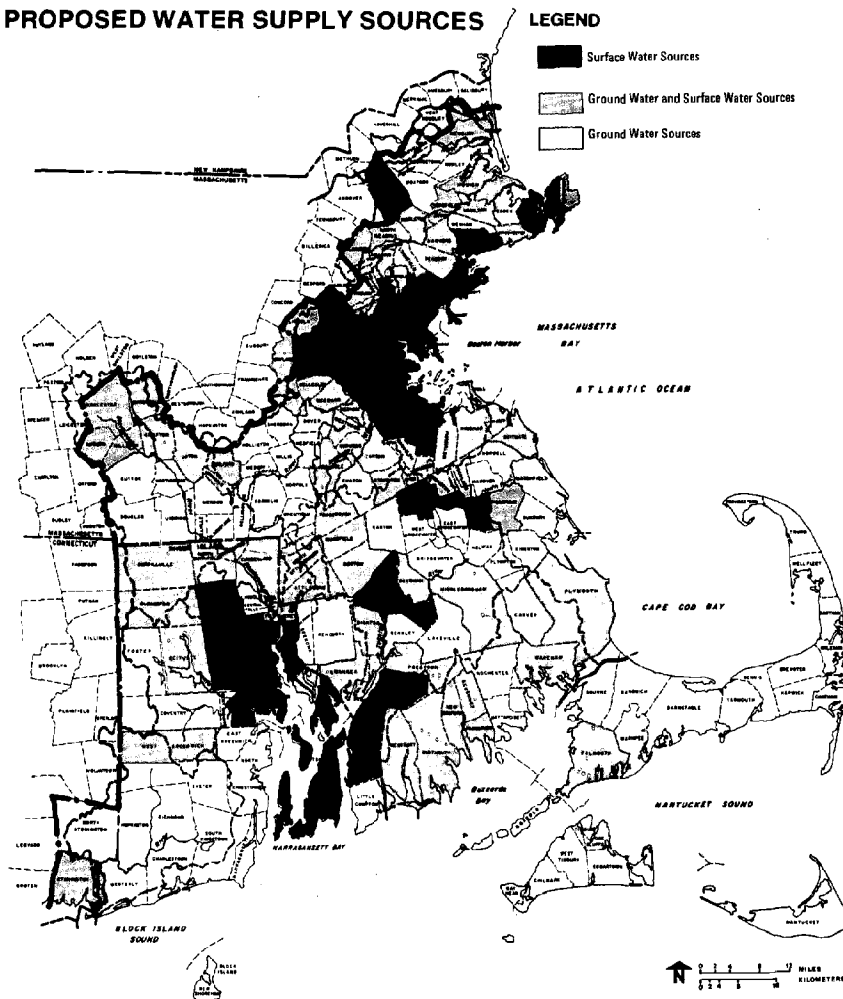
COMPARISON OF PROJECTED POPULATION GROWTH AND POPULATION CAPACITY OF SEWER FACILITIES IN SENE PLANNING AREAS.*



*NOTE: FOR THE REGION AS A WHOLE THE UNUSED SEWER CAPACITY IS ABOUT EQUAL TO THE TWENTY YEAR PROJECTION.

With strict protection of underground water supplies and the construction of a few multi-town surface water systems, most of the communities in Southeastern New England will be able to meet their future water needs easily. But the Metropolitan District Commission, which serves communities around Boston and is the region's biggest water user, will have to look farther afield—to the Connecticut River.

PROPOSED WATER SUPPLY SOURCES



Providing Enough Water

The Situation. Direct consumer demand for water in Southeastern New England in 1970 averaged 655 million gallons per day (mgd). By 1990, this demand is expected to increase by nearly 36 percent to 890 mgd and to roughly double by 2020 for a total of from 1200 to 1400 mgd. Although the area is served by several regional water supply systems, most of the region's communities today are dependent on ground water and small reservoirs, more often than not managed by small private or municipal water supply systems. For the most part, these existing systems will be unable to meet anticipated demands with their present supplies. Moreover, the quality of available sources is threatened by forces beyond local control—highway runoff, salt storage, and other pollutants.

The two largest regional water supply systems in SENE—the Metropolitan District Commission (MDC) and the Providence Water Supply Board (PWSB)—served about 55 percent of the region's demand in 1970. The MDC supplied forty-one municipalities in eastern Massachusetts, either wholly or partially, with supplies averaging 307 mgd. The MDC's principal source of water is a series of diversions from tributaries of the Connecticut and Merrimack Rivers. The Providence Water Supply Board provided an average total of 55 mgd to seven municipalities in Rhode Island from the Scituate Reservoir, which has an estimated safe yield of 72 mgd. While both systems will have to find new sources of supply by 1990, the MDC's needs are more immediate.

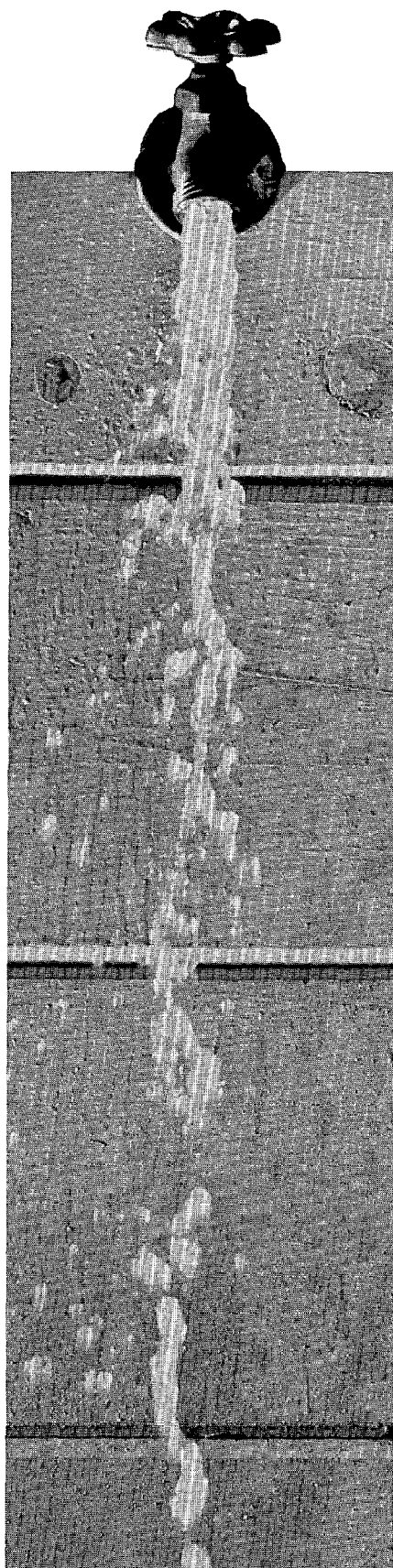
The Solutions. To meet the Study's objective of providing the people of Southeastern New England with an adequate supply of fresh water for all uses, the economic, environmental, and social impacts of a number of alternatives were examined. The Study found that, in many of the communities in Southeastern New England, local ground water is available and is the most economical source of supply. The degree to which ground water can be developed in these communities, however, varies. Over-pumping wells can significantly lower streamflow and pond levels, resulting in a corresponding degradation of the environment. Where ground water is undevelopable, reliance on regional surface water sources becomes a more economically feasible and environmentally sound alternative. Reliance on local surface water sources, however, can be extremely expensive. The acquisition of land, construction of reservoirs, system maintenance, and water treatment can be more efficiently handled by a group of municipalities in a regional water supply system than by the same municipalities acting independently.

The Study's key recommendations for ground and surface water supply applicable to the region as a whole are:

1. **Prefer local ground water development to inter-town in-basin surface water development to interbasin transfers.** To maintain future options for water supply, ground water should be protected and fully developed wherever available before surface water is considered. Interbasin transfers should be considered after local resources have been used as fully as is economically feasible and environmentally sound.
2. **Encourage regionalization of surface water supply systems.** Where surface water development is the only alternative, towns should be encouraged to form regional water supply systems to maximize cost efficiency and quality control, and to allow cost sharing. New or expanded regional systems should be established in the Ipswich River, Taunton, Brockton, Providence, and South Shore areas.

To meet the rapidly expanding needs of the Metropolitan District Commission, the U.S. Army Corps of Engineers and the Massachusetts Water Resources Commission have recommended two additional diversions from the Connecticut River Basin: a 72 mgd diversion directly from the Connecticut River via the Northfield Mountain pumped storage hydroelectric plant, and a 76 mgd diversion from the tributary Millers River Basin to meet demands through 1990. After exhaustive investigation of local ground water and inter-town surface water alternatives for MDC municipalities, the SENE Study has concluded that both diversions are necessary. However, the Study has also determined that these two projects should be sufficient to meet projected demands through 2020.

3. **Expand MDC sources by completing the Northfield Mountain facility. Carry out conservation measures. Plan the Millers River facility.** The MDC should proceed with the Northfield project at once. Both this and any future diversions should meet conditions set by the 1980 Connecticut River Basin Plan. Planning and design for the Millers River diversion should also begin, with a scheduled completion in the late 1980s. The MDC should continue to examine the technical, economic, and environmental feasibility and timing of other alternatives for meeting long-range needs.



For Rhode Island, the recommended maximum development of local ground water supplies may take some pressure off major water supply systems. The proposed Big River Reservoir should provide an adequate additional supply of water to many Rhode Island municipalities well through 1990.

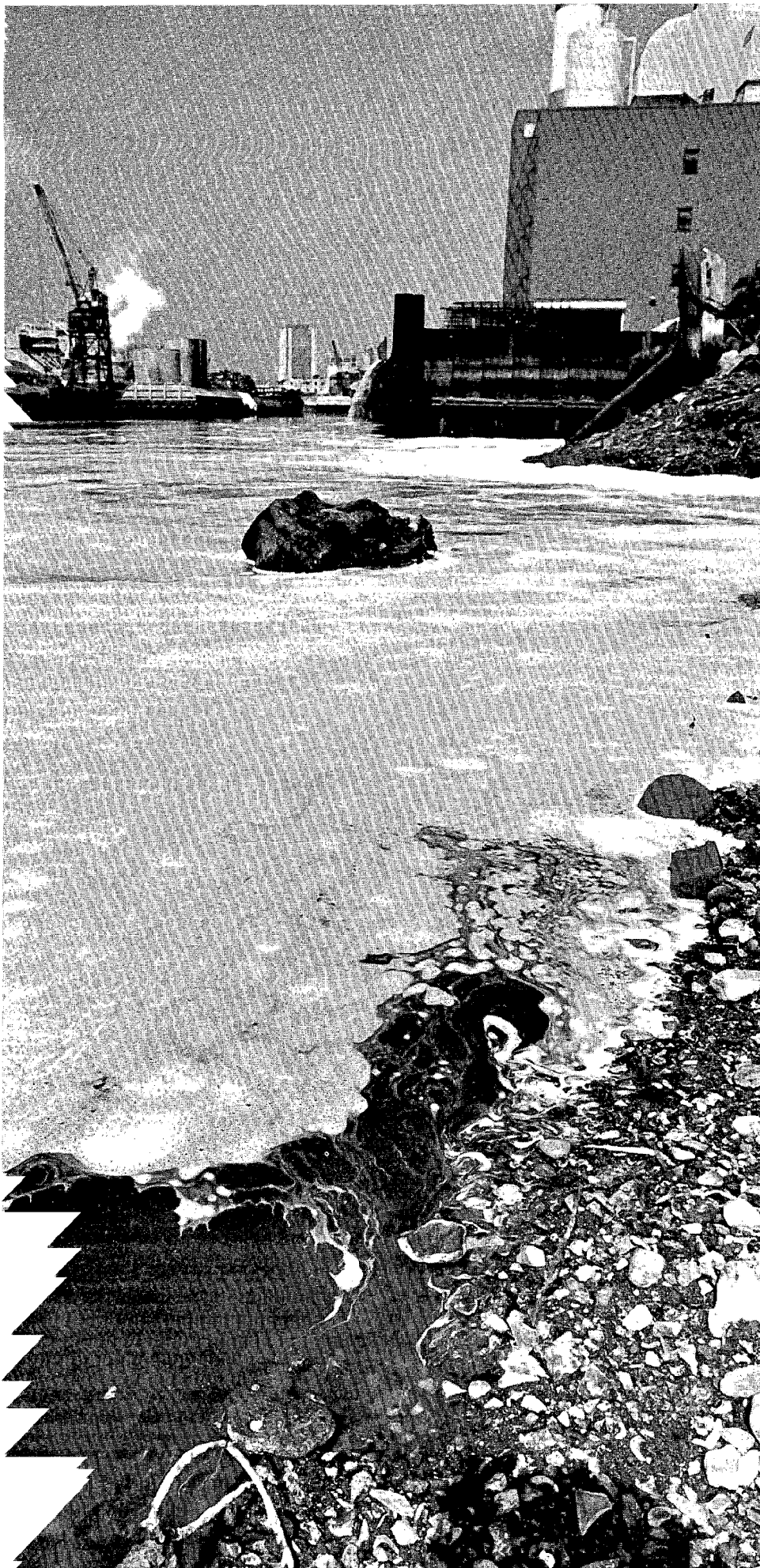
4. **Construction of the Big River Reservoir should begin immediately** to provide an additional 26 mgd to Rhode Island municipalities. The reservoir will be managed by either the State or by the Providence Water Supply Board.

Other priority recommendations include:

- (a) maintaining the quality of existing water supplies; (b) acquiring key watersheds and potential well sites; (c) reducing water use through pricing (for high volume users) and public education; (d) establishing regional comprehensive water supply and quality management agencies in key areas; (e) restricting activities harmful to ground water quality; and (f) monitoring salt water encroachment in coastal aquifers.

Implications. The efficient use and protection of existing sources of water, coupled with careful planning and development of additional sources, should provide the residents and industries of the SENE region with an adequate supply of fresh water over the next 50 years. Because of the intimate relationship between water supply and water quality, coordinated water supply and quality planning can provide more efficient methods of water management and environmental protection. Maximum use of in-basin resources will help to maintain local autonomy, will minimize reliance on out-of-region sources, and will preserve flexibility in water supply policies. In addition, advanced technologies such as desalination and wastewater recycling could become more economically feasible after 1990. Such technologies may allow the development of new sources of water without placing increased stress on the region's natural resources.

The Providence Water Supply Board should be able to rely on the Scituate and Big River reservoirs well through 1990. Similarly, the longer communities near the MDC service area can rely on local sources, the longer planned diversions can serve the MDC's needs. After 1990, advanced technology may provide new sources for MDC communities, and water quality improvements may make diversions from the Merrimack River feasible.



Cleaning Up Our Rivers and Harbors

A massive local, state, and federal cleanup effort is under way in each state to reach the national goal of swimmable-fishable water by 1983. It does not look like that goal can be reached everywhere. Instead, current federal and state efforts are aimed at buying the most widespread attainment of swimmable-fishable water with the funds available, and preserving already clean water. The Study concurs.

The Situation. About two-thirds of the total length of major streams in SENE are below established water quality standards. In contrast, the quality of coastal waters is generally high, except in harbors that receive stormwater runoff and municipal wastewater. Overall, water pollution problems are worst near Boston and Providence and in the Taunton and Blackstone River Valleys, the very areas where clean water would benefit the most people. The Massachusetts Division of Water Pollution Control and the Rhode Island Department of Water Supply and Pollution Control and the states' respective health departments are working with the U.S. Environmental Protection Agency to make as much of the region's water clean enough for swimming and fishing as possible by 1983. Despite their efforts, it is unrealistic to assume that the national goal of no discharges by 1985 will be reached.

The major sources of water pollution are listed below in decreasing order of regionwide significance. In any particular part of the SENE region, the order could be different.

A massive federal and state cleanup is under way to make scenes like this a thing of the past. We are on the way toward eliminating industrial pollution, but in some major cities cleaning up the discharges from combined storm and waste sewers will be difficult and very costly.

To end pollution from municipal sewage discharges, the region's second largest source, many new, technically sophisticated, and costly treatment plants (photo at right) will have to be built.

a. Urban Stormwater Runoff/Combined Sewers. In most of the major cities in SENE, the stormwater runoff systems and the sanitary waste systems are combined. Any heavy rain overtaxes the capacity of the combined sewer and treatment system, and the wastes are in most cases flushed untreated into the nearest river or harbor. These occasional surges probably add more pollutants to the water over the course of a year than the continuous discharges from municipal wastewater treatment plants. The major problem is handling the sudden high volume of water. Urban stormwater runoff and combined sewer problems are particularly severe around Boston, New Bedford, Worcester, Fall River, Newport, and Providence.

b. Municipal Discharges. About 80 municipal wastewater treatment plants now serve 3.4 million people, about 70 percent of the region's population. Of these, 2.4 million are still connected to plants providing only primary treatment (solids removal), while most of the rest are connected to plants providing secondary treatment (90 percent removal of organic matter). In some places, advanced treatment (nutrient removal) is already being provided. The remaining 30 percent of the population use septic tanks. Municipal discharge problems are most severe around Boston and Buzzards Bay, and in the Taunton, Blackstone, and Pawtuxet River Valleys.

The Federal Water Pollution Control Act Amendments of 1972 authorize funds for correcting the problems of stormwater runoff and municipal discharges. However, the states believe that the level of funding actually appropriated is inadequate to solve these problems, particularly in instances of combined sewer overflows.

c. Industrial Discharges. Of 78 major existing industrial discharges, 22 will be connected to municipal systems or eliminated by subsurface disposal methods, by process changes, or by the closing or moving of a firm. The remaining 56 are on schedule to meet the national goal of best practicable treatment of industrial discharges by July 1, 1977. Industrial pollution is currently severe around Boston, and in the Taunton, Blackstone, and Pawtuxet River Valleys, but great strides are being made to eliminate these discharges.

d. Non-Point Sources. While it generally enters our waterways by way of a combined sewer outfall, urban stormwater runoff, discussed above, is probably the worst non-point source of pollution. Septic systems serve about a third of the SENE region's population. Seepage from these systems is a major cause of both surface and ground water contamination. The problem is most serious in two planning areas—Ipswich-North Shore, and Cape Cod and the Islands. Agricultural runoff problems are generally confined to Buzzards Bay and the Taunton River Basin. The extent of pollution from water draining through landfills is poorly documented, but it is believed to be generally local and minor.

e. Oil Pollution. Oil spills are a special problem, particularly around Boston, but also near Providence and in Narragansett Bay where large volumes of petroleum products are transported and stored. Other sources probably discharge more hydrocarbons, but large oil spills are visible and concentrated, and their long-term effects are not clearly understood.

f. Watercraft Wastes. These discharges are probably not regionally significant but are particularly unpleasant in popular harbors and near

beaches and shellfish harvest areas. The impact is intensified by the mobility of watercraft, permitting discharges at almost any location.

The Solutions. The SENE Study endorses the interim national water quality goal of making our water clean enough for swimming and fishing wherever possible by 1983. To reach that goal, the Study gave highest priority to the following recommendations:

- 1. Stress non-degradation in areas now swimmable-fishable.** To accomplish the objective of maximizing swimmable-fishable waters, it is much easier, less costly, and more politically appealing to keep existing waters clean, than it is to restore them once they have become polluted.
- 2. Emphasize treatment of combined sewer overflows.** Combined sewers are probably the biggest source of pollution in SENE. Although treatment is costly and presents many technical problems, it is generally far more effective than treating stormwater and wastewater separately.
- 3. Accelerate federal grants for municipal wastewater treatment.** Municipal discharges are the second biggest source of pollution in SENE. Rhode Island and Massachusetts have already prepared, or are preparing comprehensive water quality plans, but implementation is bogged down by delays in applications for federal grants, and the lead time needed for treatment plant construction.



- 4. Continue current industrial permits program.** Industrial discharges are the third biggest source of pollution in SENE. The current program to eliminate them is on schedule and working well. Program administrators and private industry deserve more public recognition of their achievements.

Other high priority recommendations include: (a) implementing current state non-degradation policies; (b) beginning a systematic, regionwide stormwater and wet-weather stream sampling program as a first step toward understanding non-point source pollution; (c) making the towns or areawide management agencies responsible for the disposal of pumpings from cesspools and septic tanks; and (d) giving preservation priority to Cape Cod, and clean up priority to New Bedford, Providence, and Boston, in that order.

Implications. If the Study's water quality recommendations are carried out, water already clean enough for swimming and fishing will be preserved and polluted water will be restored by 1983, wherever restoration is realistically attainable. Direct costs to government, industry, and taxpayers may approach \$5 billion. However, improved water quality will have important economic as well as environmental value. Outdoor recreation and tourism will be stimulated, shellfishing will resume, and land values will increase. In the long-run, cleaner water will mean a more pleasant living environment, and that will be important if the region is to attract and hold the skilled workers it will need for its increasingly services-oriented economy.

The recommended program should also be politically attractive: it adopts or gives new emphasis to popular, ongoing, long-range programs that have already won political support. Past experience has indicated that individual municipal efforts to improve water quality are costly, difficult to manage, and may not always achieve environmental objectives. Areawide approaches linking groups of communities and industries are therefore essential to the success of the clean up effort.

As our oil demands increase, tanker traffic in our major harbors will increase, too. Oil spills are an ever-present danger. There were over 50 spills last year in Boston Harbor alone. The Study calls for a regional port study to find out if there is a more efficient way to meet our oil needs.



Increasing Recreational Opportunities

Southeastern New England is a recreational and tourist center of national significance, each year drawing millions of visitors. It is a region of exceptional natural beauty. And yet hundreds of thousands of the region's urban residents are either unable to reach, or are denied access to, its recreational opportunities. For many, a shoreline recreational experience means fishing in a dirty harbor from a decaying wharf. We can and should do more.

The Situation. Perhaps the most widespread use of SENE's water and related resources is for outdoor recreation. As the region's population continues to grow, the demand for outdoor recreation opportunities and facilities will also grow. In fact, recreation demands are expected to roughly double in the next 50 years.

If the anticipated increase in demand by 1990 is to be met, it will require about 2,000 acres of developed public swimming beach, about 14,000 picnic sites, about 20,000 camp sites, about 500 boat launching ramps, about 20,000 slips and moorings, and about 130,000 acres of natural area for such extensive outdoor recreation pursuits as nature study and hiking.

Existing facilities can accommodate about two-thirds of the demand for slips and moorings and extensive outdoor recreation, about half the swimming demand, and about one-third of the demand for picnicking, camping, and boat ramps. Opportunities for hunting and fresh water fishing within the densely populated SENE region are inadequate. Currently demand for hunting and fishing within the Study area exceeds resource supply and is expected to continue to do so in the future.

Through such ongoing programs as the Land and Water Conservation Fund of the U.S. Bureau of Outdoor Recreation, and the programs of the Departments of Natural Resources in Rhode Island and Environmental Management in Massachusetts, and local governments, many more of the region's requirements can be met. Much more remains to be done, however.

Efforts to meet the region's recreational demands are frustrated by a number of basic problems. Oversimplifying somewhat, the centers of greatest recreational demand and the facilities for meeting that demand are not in the same place. The amount of recreation land per



resident in the Providence, Boston, and Worcester metropolitan areas is grossly inadequate. What's more, many of these residents, one-third of whom lack automobiles, have no way to reach existing recreation facilities. Moreover, the capacity of the region's recreational facilities to meet all of the urban and tourist demands is questionable.

Despite these problems, the SENE region is rich in recreation potential. Its miles of streams and coastline, and acres of lake and forestland offer considerable opportunity to meet much, if not all, of the region's needs for recreation. Converting this potential into new facilities, however, faces two important hurdles. First, recreational use of these lands is in direct competition with other legitimate uses of the land, primarily residential and commercial development. Moreover, short of outright acquisition, public access to private lands is very limited. At present, only 225 of the region's 1540 miles of coastline are open to the public for recreation. Only one out of every 10 acres has guaranteed public access. Most of the nearly 1200 stream-bank miles are privately owned and closed to

the public. Funds to acquire new land for recreational activities are limited. New solutions are needed.

The Solutions. The protection and management of SENE's Critical Environmental Areas, through the Study's proposals for guiding growth, should provide land to satisfy some of the demand for hunting, hiking, canoeing, sport fishing, and certain extensive forms of outdoor recreation. To satisfy the region's other more intensive recreational needs, the Study developed 21 specific recommendations. Highest priority was given to the following:

1. **The respective states should execute their current plans to acquire and develop the Boston Harbor Islands and Narragansett Bay Islands Park.** With inexpensive access and well-developed day use facilities, these two plans would help meet the region's most critical unmet recreational demands. That such an opportunity should occur twice in the region, adjacent to the largest de-

mand centers, is astounding. The opportunity should be seized at once.

2. **The respective states should begin to (a) improve facilities of existing beaches,** such as Wollaston near Boston, and Goddard Park State Beach near Providence; **(b) secure public access to the shoreline,** including continuation of Rhode Island's public access program and consideration by Massachusetts of various programs and legislation for improving access; and **(c) improve public transportation access,** including parking facilities, and the use of shuttle buses.
3. **Within urban centers recreation opportunities should be increased through every available means,** including outright purchase where possible, and increasing the efficiency of existing areas.

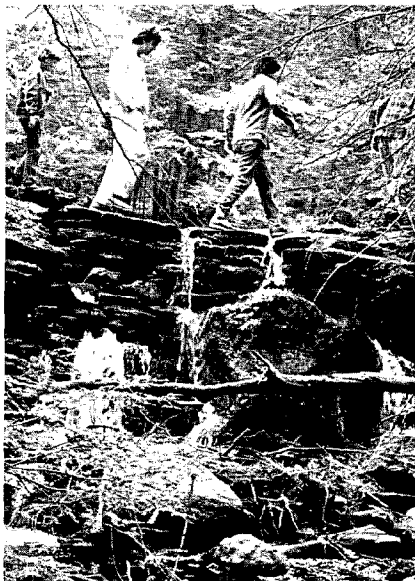


Other high priority recommendations include:

(a) adjusting current policy so as to permit limited public recreational use of secondary water supply reservoir lands, for low-intensity activities like walking and picnicking; (b) designating parts of the Charles, North, Ipswich, and Taunton, and consideration of the North and South Rivers, as Massachusetts Scenic Rivers, and the Wood, Beaver, and Pawcatuck as Rhode Island Scenic Rivers; and (c) developing new recreational boating harbors at Salem, Plymouth, Warwick-East Greenwich, and Providence-East Providence; (d) studying the possibility of adding sand to 12 other beaches—such as Crane Beach in Ipswich, Massachusetts—to combat erosion and especially to increase their capacities; (e) encouraging the private sector to provide more recreational opportunities, keeping in mind the protection of Critical Environmental Areas.

Implications. It is difficult to measure the benefits of recreational programs. Clearly the greatest advantage, particularly of the two priority recommendations, is the improvement they would bring to the quality of life of the people living in the region's largest urban centers. In addition, direct economic benefits in the commercial recreation business could be substantial. Meeting all of the currently unmet needs for outdoor recreation through 1990 has an estimated value of about a quarter of a billion dollars annually. More importantly, providing facilities and increased recreational opportunities will improve the region's attractiveness as a place to live, and strengthen its ability to draw and hold the skills essential for its increasingly services-oriented economy.

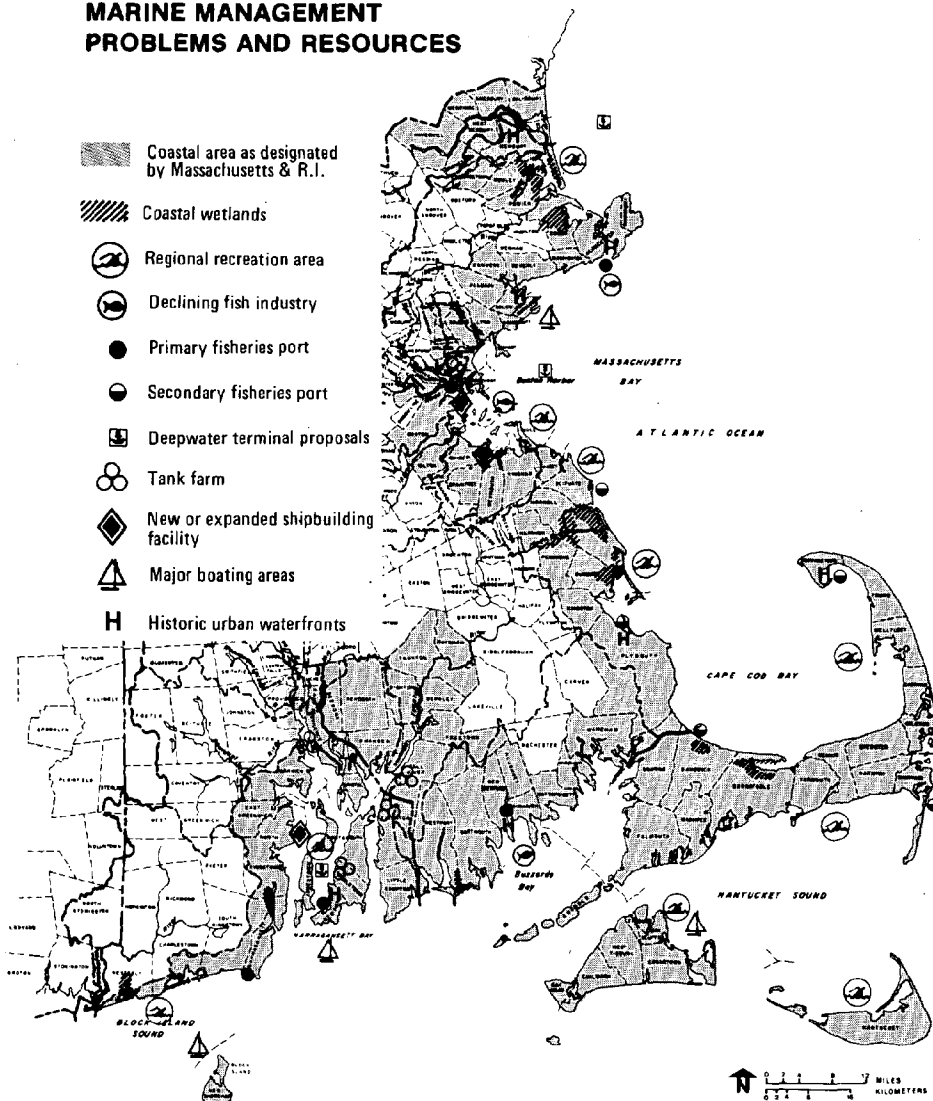
There are a surprising number of scenic natural areas (right) and clean, unspoiled rivers (above) in SENE, many in or near densely populated areas. The Study urges that Scenic Rivers legislation and other measures be implemented as a way to protect these areas and help meet our future recreation needs.



Putting The Sea Back In Our Lives

The history of the region's ties to the sea is a long and colorful one. Yet for the last several decades SENE's ports, fisheries, and urban waterfronts have been declining. The Study concludes that this is not an inevitable result of progress, but the result of external pressures, internal economic problems, and outright neglect.

MARINE MANAGEMENT PROBLEMS AND RESOURCES



The Situation. As part of its objective to improve the management of the region's marine resources, the Study investigated offshore fisheries, shellfish and aquaculture, port development, dredged materials disposal, offshore sand and gravel extraction, and the status of the region's urban waterfronts.

There are two key issues facing *offshore fisheries*: intense international harvesting pressure and the inability of the region's fishing industry to efficiently compete with subsidized foreign fleets. In the last decade, key species have been depleted by sequentially "fishing out" specific stocks, resulting in whole fishing areas being closed. Between 1964 and 1965, foreign landings of silver hake were six times higher than the previous average. These were followed in 1965 and 1966 with haddock (580 percent higher), in 1968 and 1969 with herring (450 percent higher), and in 1969 and 1970 with yellowtail flounder (300 percent higher). Most recently, in 1971 and 1972, mackerel landings have averaged an astounding 127 times the average landings for the period from 1961 through 1966. In each case, markedly lower catches followed these inordinately high foreign landings.

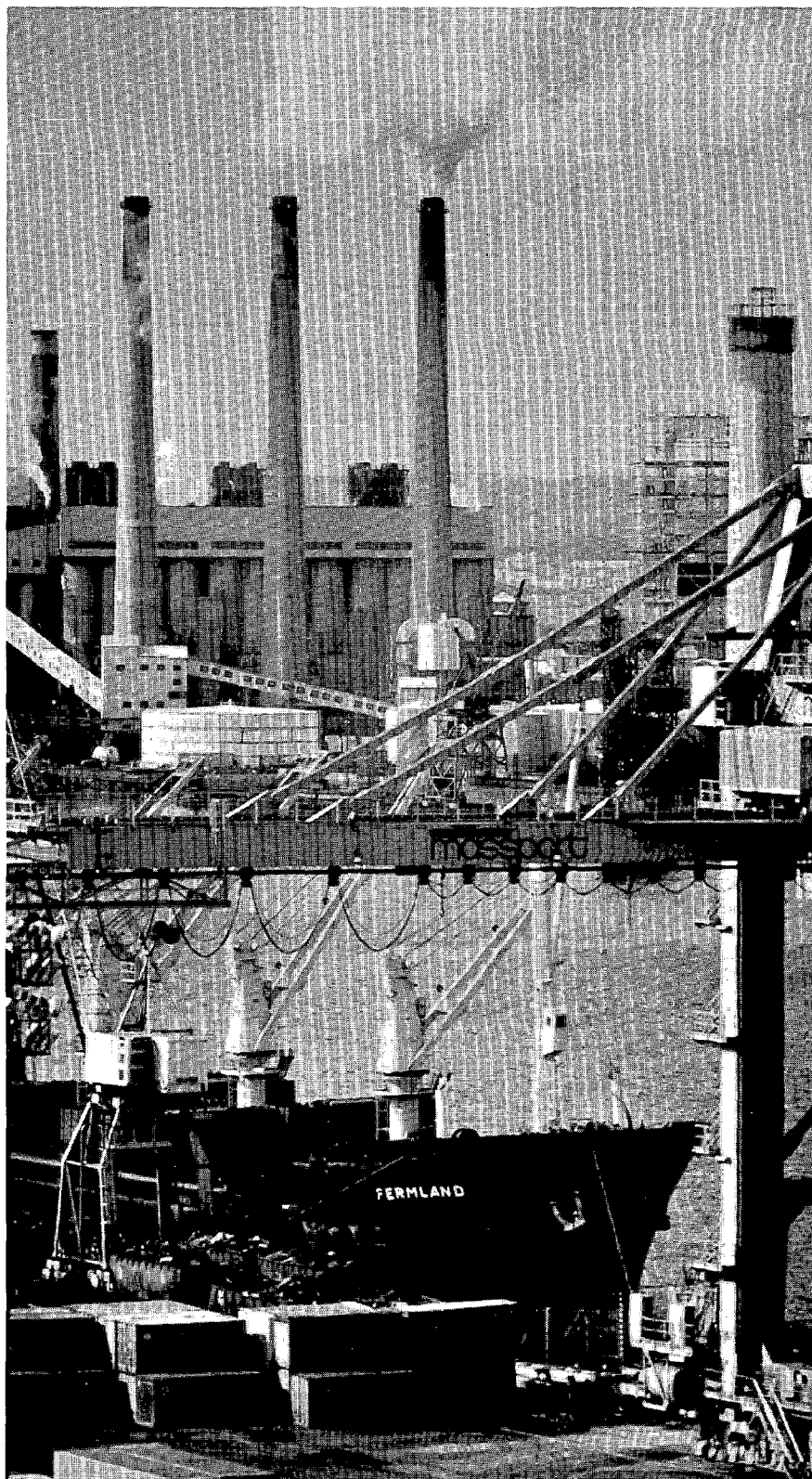
The SENE region's fishing industry—except for the Port of Point Judith—also has internal and operational problems. In addition to the adverse impact of foreign competition, the high cost of harvesting, labor, management, processing, and new capital has diminished the efficiency of the industry. Nevertheless, the industry is important to the region's economy, pro-



viding nearly 30,000 jobs and representing \$160 million invested in vessels in Massachusetts alone. If the fishing grounds continue to be overfished, a significant world food source will be lost. If the domestic fishing industry is not revitalized, a significant regional economic asset will be lost.

Shellfish flats in Massachusetts are managed by town wardens at varying levels of efficiency and productivity. The Rhode Island Department of Natural Resources has jurisdiction over the shellfish beds along its coastline. Properly managed, the region's shellfish yields are valued in terms of thousands of dollars per acre. However, many of the SENE region's 30,000 acres are closed due to pollution or are otherwise underproductive. In an effort to supplement stocks of shellfish available from natural sources, *private aquacultural operations* have been initiated on a small scale in the region with varying degrees of success. Even though a lot of well-researched scientific information is available, it has been difficult to produce marketable quantities of commercially grown shellfish at economically competitive prices.

Port planning is conducted by individual city or metropolitan agencies with little regard for regional coordination. In both major ports, Boston and Providence, an excess capacity of storage sheds, warehouses, and wharfage exists—evidence of the overall decline in conventional dry cargo shipping. Major changes in global trading patterns require regional coordination of port improvements if the SENE region is to regain a portion of world-wide shipping and commerce. The port of Boston, through the innovative leadership of the Massachusetts Port Authority, leads the way in development of new shipping techniques, such as containerization, and more significantly, planning for deep water oil terminals. However, extremely high capital investments are required and complex infrastructure is needed to support a major oil terminal. This indicates that, in a market as small as SENE's, coordination of port development, rather than competition, would yield the highest returns to the region. The problem of disposing of dredged materials from channel improvements is another contributing factor to the stagnation of some of the region's ports. A nationwide U.S. Army Corps of Engineers study on disposal options will shortly lead to improved regulations. Existing interim federal guidelines for disposal of dredged materials give careful consideration to



The port of Boston leads the way in development of new shipping techniques. The Study proposes a regional effort to revitalize many of our other ports and harbors.

economic and environmental benefits and costs. These guidelines are felt to be adequate for continued interim uses.

Sand and gravel mining in offshore waters is a relatively new concept in the United States, although much experience has been gained with such operations in Northern European waters. Initial analysis shows that while it may prove a useful supplement to conventional on-shore sources, mining in near-shore waters may pose unacceptable environmental and economic costs. One significant drawback, in addition to the need for a low conflict site further offshore, is the need for a significant market immediately adjacent to the land area for such a system to be cost-effective. Only Boston meets that qualification in SENE.

SENE's *urban waterfronts* are a major resource whose potential has long been neglected. Extensive wharfage, now decayed and no longer suitable for modern shipping needs, is available for multiple use planning in several of the region's ports. Of the many activities already located on the waterfront today, few have any real need for the waterfront location and the Study encourages redevelopment of this valuable land to water related and complementary uses.

The Solutions. Although the SENE Study addressed a number of separate marine management issues, several priority recommendations emerged:

1. **The United States should immediately establish a 200-mile offshore economic zone**, adopt a national fisheries management program, and effectively manage Georges Bank as an important world food resource before it is over exploited. In light of the apparent inability of the existing international commission to manage the resource, unilateral control by the U.S.—while still permitting foreign fishing vessels—would assure that no area or species was being overfished.
2. **Initiate a regional port planning and development program.** The New England coastal states and appropriate federal agencies, working through the New England Regional Commission, and with the assistance of the New England River Basins Commission, should undertake a regional port planning study to determine the most efficient port de-

velopment system for handling the region's shipping and cargo distribution needs, with an emphasis on developing an oil handling policy.

3. **Develop policy and program regulating commercial extraction activities in coastal waters.** Each state coastal zone program should develop policies and programs regulating commercial extraction activities, especially for sand and gravel, in coastal waters.
4. **The states' coastal zone management programs should review the redevelopment potential of the region's decaying urban waterfronts using block grants through the Community Development Act of 1974.** Responsibility for redevelopment should continue at the local level under state leadership and coordination of federal funding programs.

Other marine management recommendations receiving somewhat lower priority include:

- (a) increase state technical assistance to town shellfish wardens in Massachusetts to improve shellfish man-

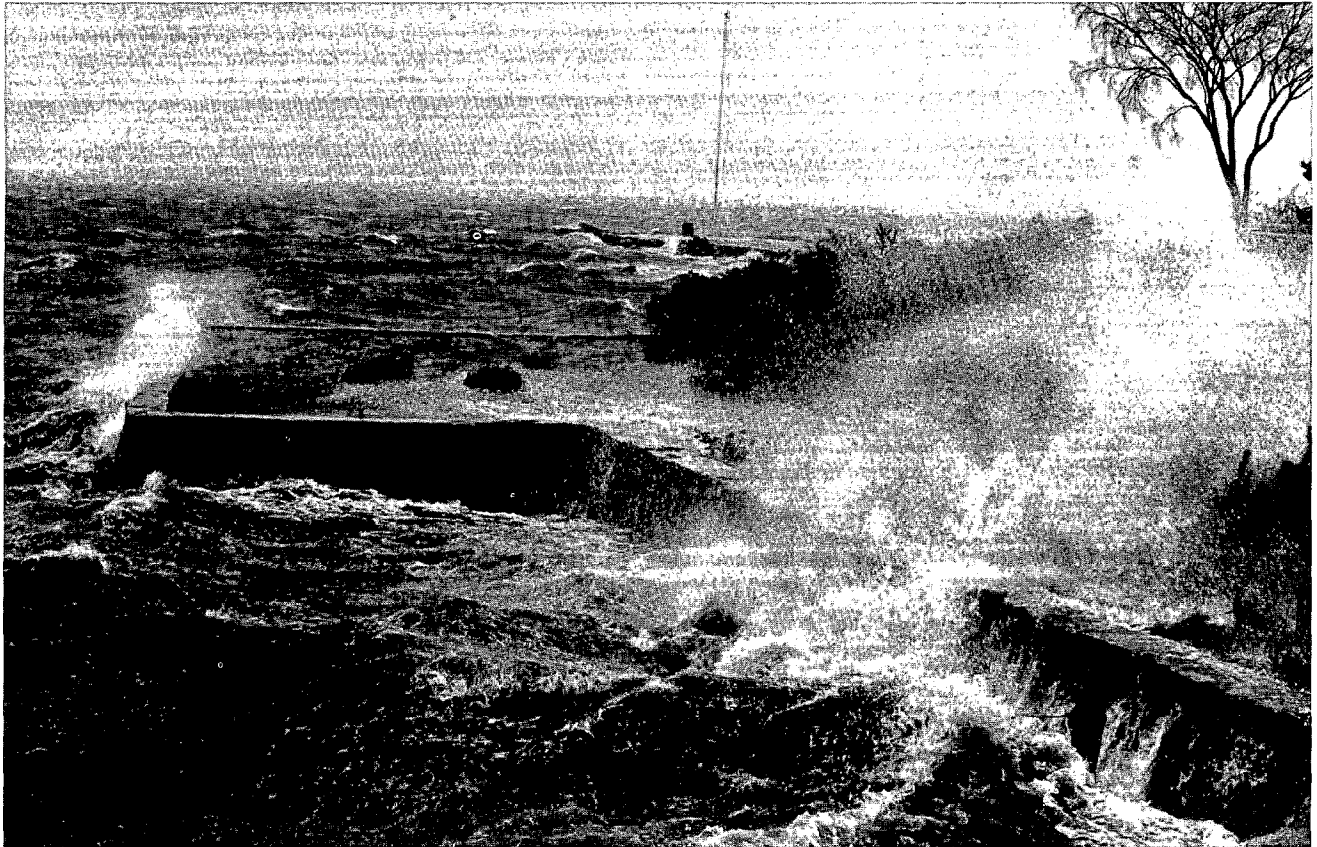


agement; (b) increase shellfish license fees in Massachusetts, and require recreational shellfish licenses in Rhode Island; (c) continue use of interim federal dredged materials disposal guidelines; (d) develop predictive modeling techniques for determining impacts of offshore sand and gravel extraction, and (e) require modern dredging equipment with on-board gravel processing capability.

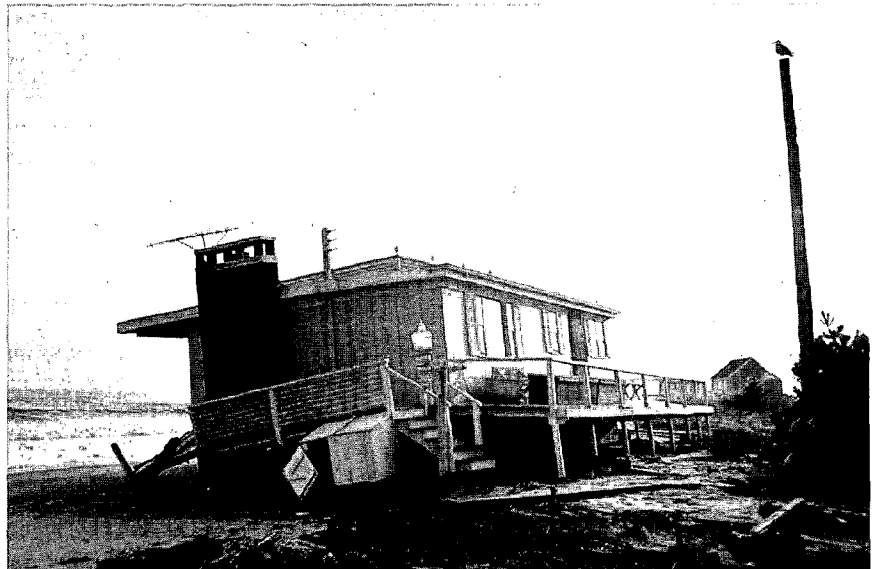
Implications. Exerting control over the offshore fishery can have profound national and international economic and social benefits. Revitalizing the region's sagging fishing industry will have substantial economic benefits for the region. Local and regional income should be stimulated by a more vigorous fishing industry. Moreover, a better managed offshore fishery retains the potential for being a major international food source for the world. In addition to the fishing industry, economic, social, and environmental benefits can accrue from the revitalization of this region's potentially scenic and vibrant urban waterfronts. Boston has already begun such a redevelopment as have Nantucket and Newburyport, Massachusetts. It was not within the scope of the Study to determine whether significant economic benefits might accrue from regional port specialization and integration, although it appears that both regional and national benefits would be generated.

A cautious go-ahead is given to the extraction of far-shore mineral resources if conventional onshore resources become unavailable or uneconomical. If the technology can be perfected, the region's offshore deposits are more than adequate to meet out needs. The Study also urges greater cooperation between local and state governments in guiding the development of aquaculture industries. Better managed natural shellfish beds and successful aquaculture can provide economic and social benefits to the region at relatively little cost. Overall, the Study's recommendations on marine management are designed to redevelop SENE's historic ties to its coastal and marine resources.





Trying to hold back the fury of a hurricane-lashed ocean (above) or a flood-swollen river is, at best, a costly losing battle. More often than not, structures built to hold back the forces of nature create a false sense of security. We build, and sooner or later, a storm stronger than our protection works pulls our investment out from under us (right). The Study offers measures to break this cycle.



Living With The Forces Of Nature

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The Situation. Southeastern New England's major coastal communities have a long history of damages from hurricanes and "northeasters". The 1954 hurricane caused over \$154 million in damages along the Rhode Island and southern Massachusetts coasts. Major tidal flood protection projects have since been built at Providence and New Bedford.

A 1959 "northeaster" caused damages totaling six million along the Massachusetts coast, from Newburyport to Plymouth. In contrast, damages from inland riverine flooding have been relatively minor, except for the heavily developed reaches of rivers such as the Blackstone and Pawtuxet. The 1955 flood of record in the Blackstone River caused over \$65 million in damages. Four flood protection projects have since been built in the Blackstone River basin: a diversion project at Worcester, a floodwater storage reservoir at West Hill (Uxbridge, Massachusetts), and two local protection projects at Worcester. Elsewhere, the region's inland flood damages have been surprisingly low because, unlike many other parts of New England, the SENE region retains vast expanses of flood flow holding wetlands and flood plains. Thus, the opportunity exists for the region to continue to experience only minor damages, if these critical lands remain undeveloped.

The inland and coastal erosion situation closely parallels flooding. The region's topography and soils are such that inland erosion is relatively insignificant. In contrast, however, many of the region's most heavily used beaches are eroding more than three feet per year. Key problem areas are Plum Island on the North Shore, the northern portion of the South Shore, portions of Cape Cod and the Islands, Block Island, and coastal Rhode Island.

A multitude of federal and state programs are proposed or in progress in the region to reduce flood damages. Some of the federal programs include Soil Conservation Service and Corps of Engineers flood control projects; the Corps of Engineers Pawcatuck-Narragansett Bay Study, initially designed as a comprehensive flood

management program but recently proposed to be expanded to include wastewater management, water supply, navigation, and other considerations, particularly for the Pawtuxet and Blackstone and Vicinity; the Corps' landmark Charles River flood plain wetlands acquisition program; and the Department of Housing and Urban Development's National Flood Insurance Program, under which every community in SENE has been declared flood prone. Both states have enacted legislation designed to protect critical inland and coastal wetlands.

The region's flooding and erosion problems can be lessened significantly under existing federal and state programs. The Study recommends using a combination of structural solutions, such as dams and dikes, and non-structural solutions, such as flood plain zoning and wetlands protection. Greatest emphasis is given, however, to the non-structural solutions, and for several very good reasons. For one thing, few opportunities for structural solutions exist in the SENE region. On the other hand, much of the region's natural flood and storm damage reducers—wetlands, flood plains, barrier beaches—remain intact and the Study's examination of land needed for future growth indicates these valuable areas can be avoided. The fact is that, according to the federal North Atlantic Regional Water Resources Study, using non-structural measures can reduce flood damages by as much as 75 percent by 2020. The federal government has begun to give much more support for these non-structural steps than in the past. The Water Resources Development Act of 1974 raises consideration of, and federal funding for, non-structural measures to a level comparable with structural measures for the first time.

The Solutions. The Study's key recommendations for flood damage reduction are:

1. **Prepare comprehensive flood plain management programs.** Federal and state agencies working with municipalities should prepare comprehensive flood plain management

programs by basin, making use of non-structural solutions wherever possible. First priority should be given to the Ipswich, Neponset, and Taunton River basins.

2. **Full participation in the National Flood Insurance Program** is urged for all communities.
3. **Restrict adverse development, or redevelopment, in inland or coastal flood prone areas and coastal erosion areas.** Zoning to carry out this recommendation should take advantage of existing wetlands legislation, protect barrier beaches, and be consistent with state coastal zone programs.
4. **Strengthen state wetlands legislation.**
5. **Acquire key wetlands and flood plain areas where necessary** to guarantee the public health and safety.
6. **Selectively construct flood control projects** where the area to be protected is of high value to the community, options for relocation are limited, and the cost of construction is less than acquisition of the flood hazard area.

Implications. The region's network of wetlands and flood plains provide an ideal opportunity to use non-structural measures, established at the local level under state guidance, to reduce damages. The importance of these natural areas to public health, safety, and welfare is reemphasized in the Study's priority recommendation to strictly control development on wetlands and flood plains (discussed above under *Guiding Growth*).

It has been many years since the last major hurricane or disastrous flood, and we have built on a lot of land that belongs to the sea and the rivers. Some day, inexorably, nature will take some of it back.



Electric power plants, oil tank farms, pipelines, and terminals, sand and gravel extraction operations, and solid waste disposal facilities are as critical to the economy and the public health and safety as are wetlands or flood plains. It is the Study's conclusion that the protection of suitable sites for these needed facilities should be given as high a priority as preserving Critical Environmental Areas.

Tank farms are unsightly but necessary in this oil consuming region. But high-value coastal land should not be wasted on them. They should be moved inland and serviced by pipeline instead.

Locating Key Facilities

23

The Situation. The onshore extraction of sand and gravel is noisy, dirty, and brings with it heavy equipment traffic. Power plants, refineries, and solid waste disposal sites are unsightly, and are potential polluters. Considering the generally negative effects such *key facilities* have traditionally had on the physical landscape, the "put them in someone else's backyard" attitude prevalent in most communities is understandable. But the region's economy depends on these services, and we would be worse off without them than we are with them—at least for the foreseeable future. The objective, then, is to determine how badly we need these facilities and then to provide for them in a manner which minimizes their effects on our landscape, using criteria such as resource capability, visual quality, and relationship to existing services.

Production of *sand and gravel*, two of the region's most valuable resources, was 15.3 million tons in 1970. Demand projections for the future range between 23 and 28 million tons in 1990, and between 33 and 49 million tons in 2020. Similarly, the production of crushed stone was 6.2 million tons in 1970; demand for it in 1990 is projected at 10.5 to 13.5 million tons, and between 17.4 and 27.9 million tons in 2020. However, these 1972 U.S. Bureau of Mines projections may be somewhat overestimated, because the rate of growth of road construction and housing, and the industrial demands for sand and gravel have begun to slow. Road construction alone decreased 25 percent in Massachusetts between 1971 and 1972. Technically, regardless of projects, we probably have enough sand and gravel deposits to meet our needs. But the known deposits are

rapidly being preempted by other land uses as development pressures spread outward from the region's urban centers. As convenient deposits disappear, extraction operators are forced to move further away. As a result, the availability of the commodity is decreasing and the cost, because of transportation distance, is increasing dramatically.

The availability of energy—and, by extension, its cost—has become the Achilles heel of Southeastern New England. The region's deepening energy shortages depress the economy and threaten to eclipse environmental concerns. The atmosphere of crisis is not conducive to careful decision making.

Electrical power peak market demand in the SENE service area was 5,000 megawatts in 1971. By way of comparison, the Plymouth nuclear unit produces 665 megawatts. The staff of the Federal Power Commission predicts that the annual rate of growth in power consumption will decrease from 7.6 percent in 1971 to 4.0 percent in 2020. Yet even under those conditions, the production of power will have to increase *four fold* by 1990 to meet the demand. No one is entirely confident of these or any other projections of energy needs these days. Energy consumption is responsive to many forces: price, personal income, population

growth, technology, public policy, conservation programs, changes in style and taste, and the cost and availability of alternative sources of fuel.

A number of generation technologies are available and each has its strong and weak points. Emissions from oil-fired plants can be controlled but the supply of oil is extremely unstable and the costs are skyrocketing. Coal, possibly even locally supplied, is an alternative but the environmental and health problems are costly to resolve. Heavy reliance on nuclear generation is planned for the near future, but a number of significant environmental and public safety questions remain unanswered. While some nuclear reliance may be unavoidable, the magnitude can be very significantly reduced through enforced conservation measures and thorough development of energy source alternatives—from solar energy, wind power, and even the renovation of abandoned small hydroelectric plants.

Under these circumstances, two issues are paramount. Unless Southeastern New England reduces its electricity consumption growth rate significantly, a score of new power plants will be needed in the next 15 to 40 years. Unless acceptable sites for new power plants are identified and secured now, the region will have to resort to either massive importation of power from elsewhere in the Northeast, which may not always be available, or accept significant risk of environmental degradation.

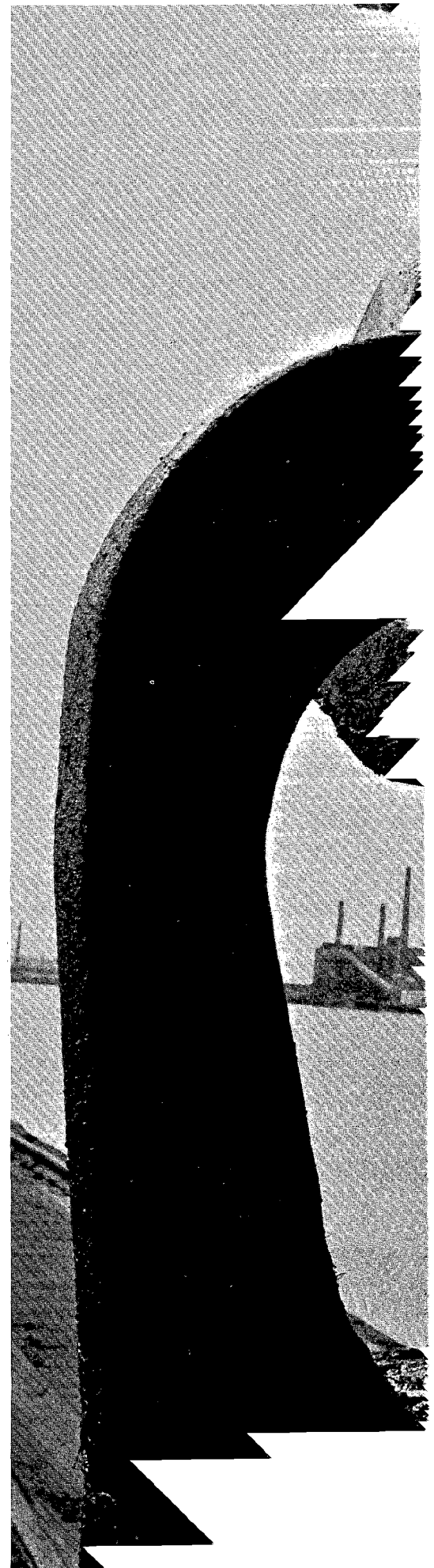


Petroleum facilities siting—refineries, tank farms, deepwater ports—is a major issue in SENE. The United States is the most oil-hungry country in the world. New England is the most oil-hungry region in the nation. And 50 percent of New England's consumption is in SENE. To complicate things further, over 50 percent of that oil is imported. The energy crisis has made everyone hesitant about making projections of future demand. Like electrical power, consumption of oil is responsive to many market and public policy factors. However, according to the best available information, consumption of petroleum in SENE by the year 2000 could vary between 2 million and 4 million barrels per day. The higher figure is based on the unlikely continuation of the pre-energy crisis rate of four percent annual increase. The lower figure is based on a 50 percent cut in that rate of increase. Even the lower figure is *four times* our current consumption. SENE neither produces nor refines oil.

The federal government and the oil industry think that significant reserves of oil and gas may exist on Georges Bank, on the outer continental shelf off Massachusetts, and the process of leasing this area for exploration has already begun. This potential, added to the region's inordinate dependence on imported petroleum, has spawned a number of proposals for refinery construction, deepwater port development and service and industrial development related to offshore exploration and production. Two issues are paramount. First, unless steps are taken to slow the region's oil consumption growth rate, the instability and high cost of oil

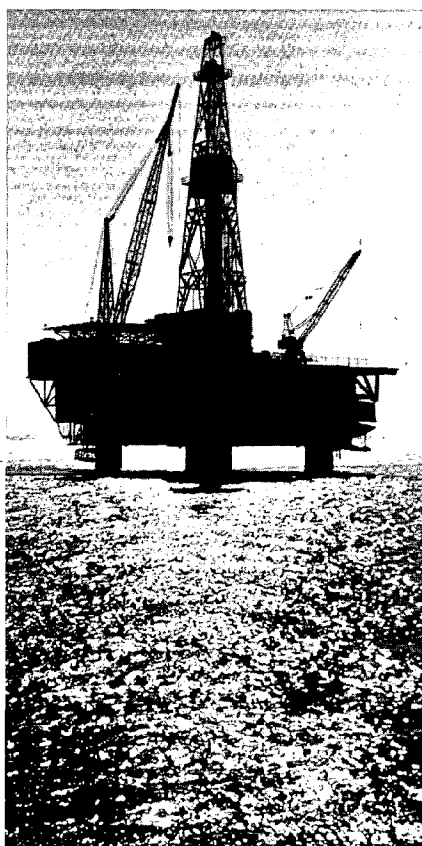
products will worsen and the region's already beleaguered industries will suffer further setbacks. Second, unless both states establish mechanisms for identifying and securing potentially acceptable industrial development sites, as well as reviewing siting proposals they will have little control over, and experience no significant benefits from, the siting and operation of such facilities.

Solid waste disposal is another important but often unwelcome service. Together both states produced over eight million tons of solid waste in 1973 and can expect to handle almost ten million tons in 1980. The Study is confident, however, that the new solid waste recovery programs established in each state will, with funding and community support, be adequate to reduce the resource degradation currently caused by dumps and poorly managed sanitary landfills.



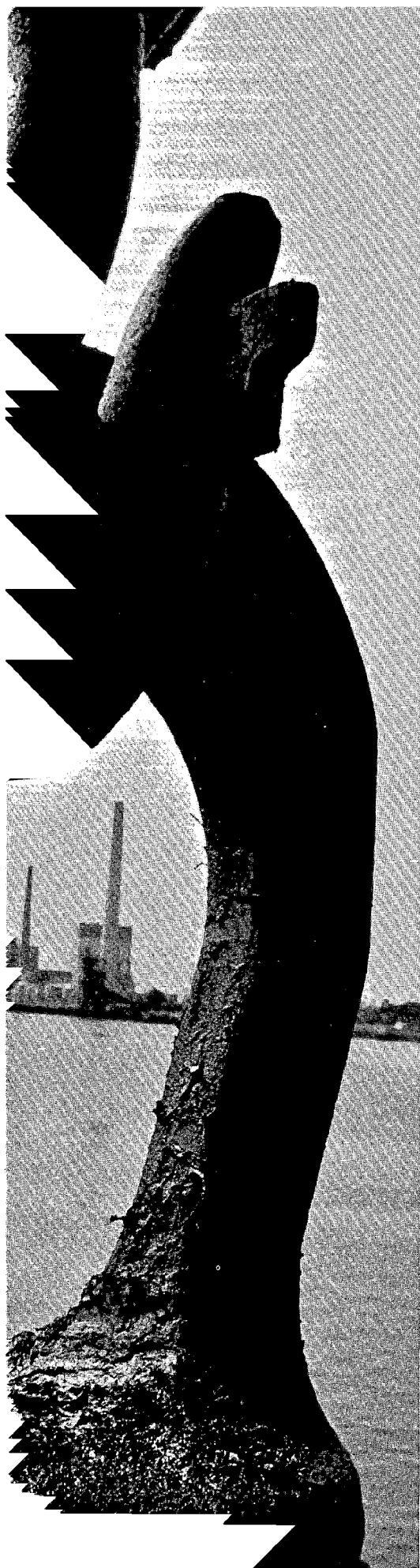
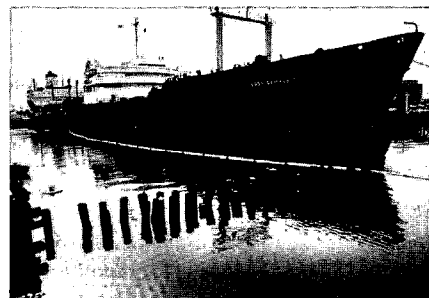
The Solutions. For each of these four vital services, siting is the key issue. For power and petroleum, the importance of siting is matched by the need to manage consumption. Highest priority recommendations include:

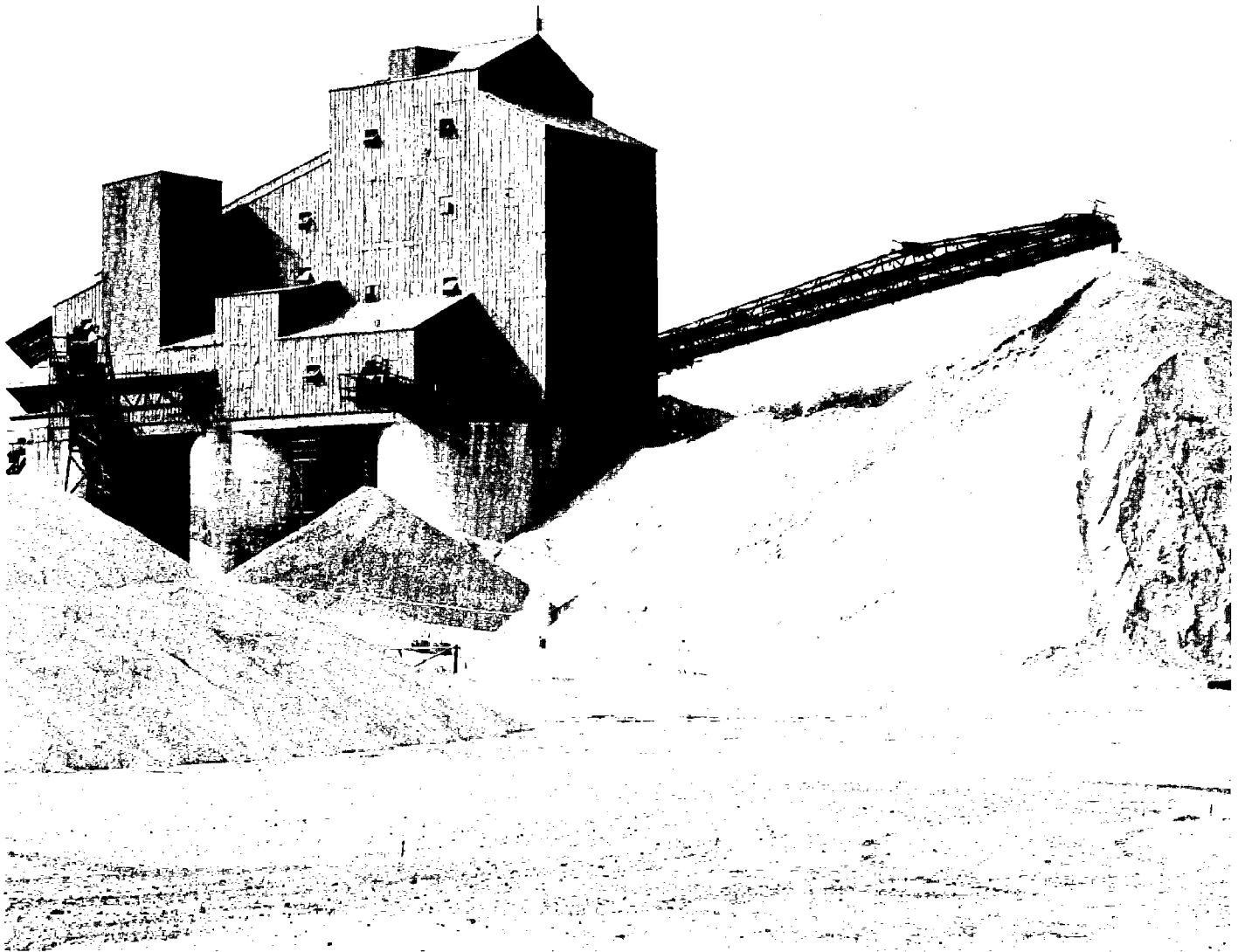
1. Establish, immediately, energy demand management and conservation programs in each state. For both electrical power and petroleum, immediate steps should be taken in both states to set voluntary and mandatory conservation measures, make changes in building code standards, and provide tax incentives to reduce demand. The success of such a program will depend in large part on the success of a recommended state energy awareness program. Both programs would be directed by the respective state energy offices.



2. Establish comprehensive energy facilities siting authorities in each state; secure sites for the future. The authority of the Rhode Island Statewide Planning Program and Massachusetts Energy Facility Siting Council should be expanded as required to give both agencies the authority to approve or reject energy facility siting proposals and to identify and secure economically and environmentally desirable sites for power plants, refineries, tank farms, and other energy-related key facilities. Lands classified by the Study as Critical Environmental Areas (described above under Guiding Growth) should be avoided.

3. Centralize mineral management authority in each state department of natural resources; manage sequential land use program. Authority for minerals resources policy-making monitoring and regulation should be centralized in the Rhode Island Department of Natural Resources and the Massachusetts Department of Environmental Quality Engineering or Department of Environmental Management. Under this new authority, the agencies should be the technical backbone of the recommended local sequential land use program designed to permit extraction of minerals and restora-





Deposits of sand and gravel are abundant in some parts of SENE, and badly needed for future construction. But they must be mined before development paves them over. The Study suggests a phased mining and reclamation strategy to meet our needs and still leave the sites attractive and developable.

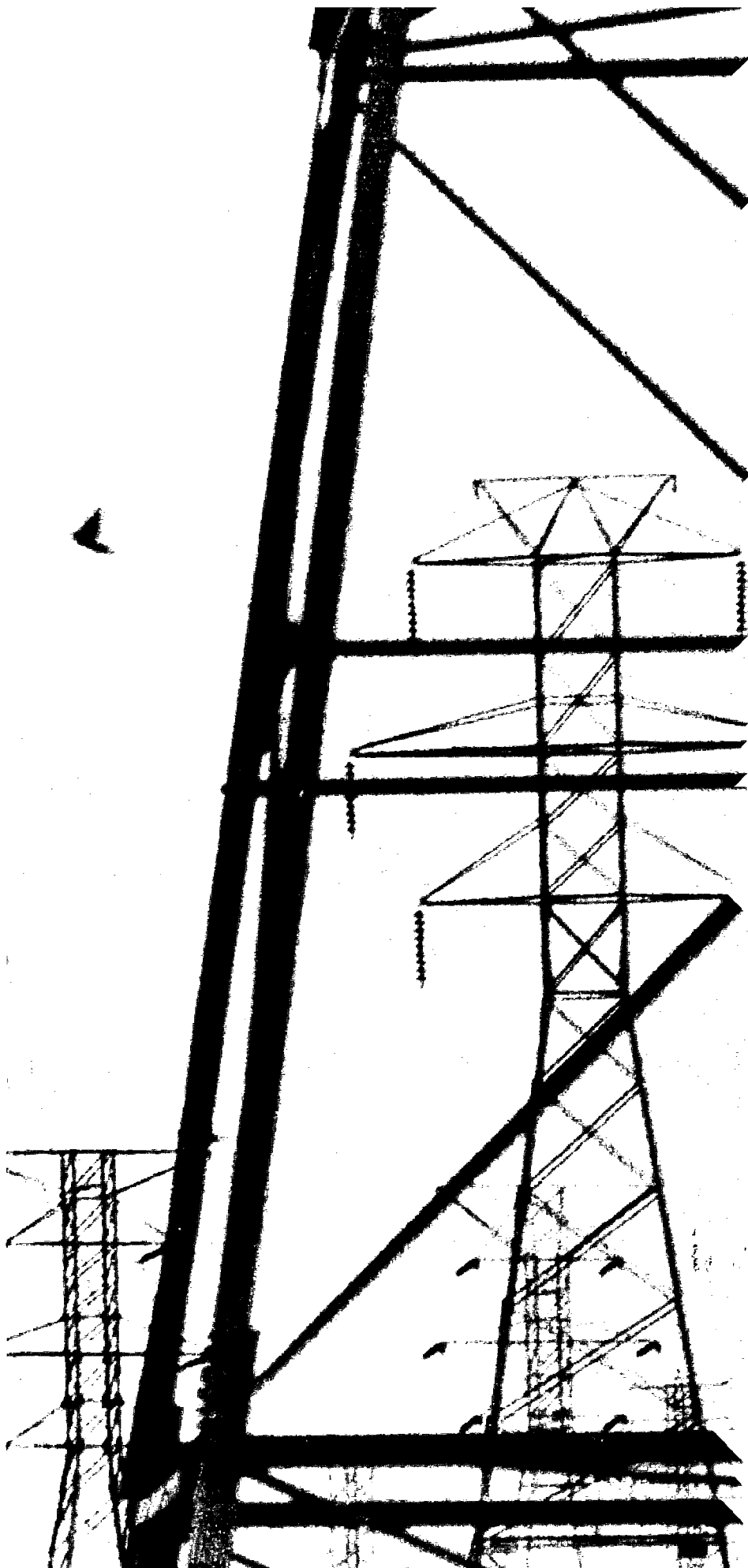
tion before preemption by other forms of development. State programs should include: public education programs to encourage protection of deposits, guidance to municipalities for permit programs, statewide operating and site rehabilitation standards, state licensing of extraction operators, and state reclamation of high-value abandoned extraction sites.

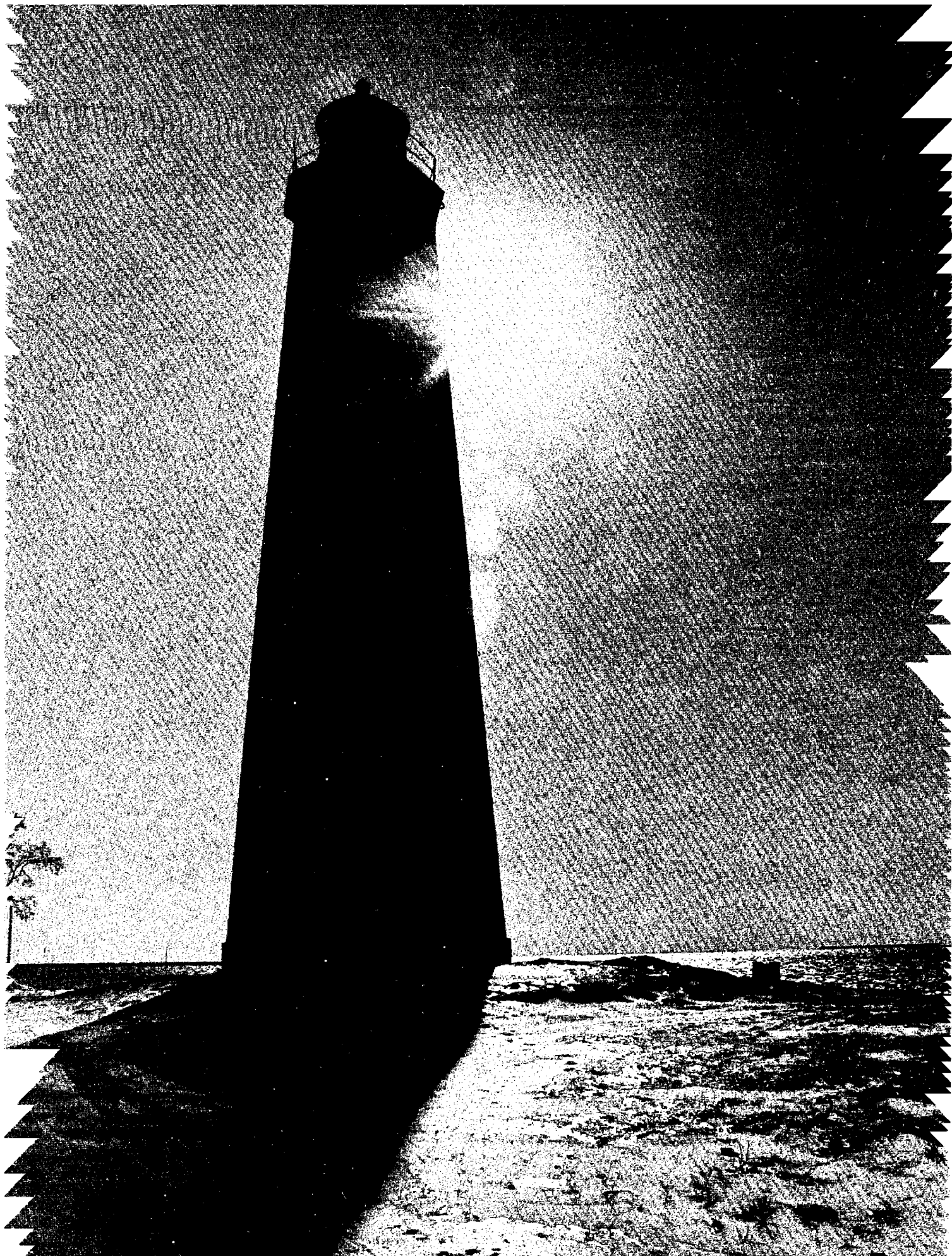
Other high priority recommendations include:

(a) studying the electrical rate structure, particularly decreasing block rates; (b) maximizing development at existing power plant sites; (c) upgrading or phasing out inefficient power plants; (d) simplifying power plant licensing procedures; (e) locating future petroleum facilities inland near infrastructure; (f) distributing refined products by pipeline; (g) enforcing existing landfill regulations; (h) funding the public Rhode Island Solid Waste Management Corporation; and (i) conducting a Massachusetts mineral survey.

Implications. Implementation of the Study's recommendations on major facilities—power plants, petroleum facilities, sand and gravel extraction operations, solid waste disposal sites will give the states a much stronger, and much more direct, method for controlling the impacts, both economic and environmental, of major developments with greater than local impact. The minor adjustments to the institutional mechanisms discussed will allow the states to become more responsive to the economic, social, and environmental needs of the entire region, rather than simply reacting to the proposals of individual developers. Both states have begun to move in the direction of controlling development which has major regional impact. The Study's recommendations are merely an extension of current state siting initiatives. Finally, if the economy of the region is to be viable at all, specific measures to slow the growth of total energy consumption in the region must be implemented immediately.

Like it or not, we will need more power in the future. Just how much will depend on how well conservation measures such as those recommended by the Study are implemented—and how soon.





Strengthening Our Natural Resources Management System

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The recommendations outlined in the preceding sections of this summary, and detailed in the full report, form a comprehensive program for guiding future growth through the management of the natural resources of South-eastern New England. The program contains some new ideas as well as some old ones which still have validity or which have been re-focused.

While the recommendations deal primarily with natural resources, they were made with an eye on the economic and social goals of both states. As with any planning activity which intimately affects people's lives, implementation can only be successful if the recommendations are integrated with the full range of state human services, economic development, and environmental goals and programs.

Both states are in the position of being able to offer that kind of integrated program planning and policy-making, though room for improvement exists. In Rhode Island, the State Planning Council (SPC) integrated the resource programs and policies of a number of agencies and has prepared a State Guide Plan for that purpose. Complete integration is hard to achieve, however, since the State Water Resources Board determines long-range water resources policies and programs on its own.

In Massachusetts, the Cabinet structure brought about by the state's recent reorganization could function through the cooperation of the Secretaries, as a program and policy coordinating body. But it is too soon to tell if that ideal can be reached.

The fact is that existing government agencies already have some of the tools needed to carry out many of the recommendations made in the SENE Study. For that reason, so we can move immediately on some of the region's most pressing resource management issues, the Study recommends:

Maximize use of existing programs and institutions. The resource management policies and programs recommended by the SENE Study should be reviewed, and appropriate state policies adopted, by the Massachusetts Cabinet and Rhode Island State Planning Council, as currently constituted.

But to effectively guide our future growth and guarantee solid economic opportunities, to

direct growth so that state programs can provide for future growth needs rather than react to the problems growth can create, some changes in the way decisions are made and who makes them, some new legislation, and some additional funds will be necessary.

The question of who should decide where growth should and should not occur—whether it be residential, commercial or industrial—is one of the most volatile issues facing us in our efforts to stimulate development and yet protect certain environmental amenities. It goes straight to the heart of the traditional balance of power between the state and its political subdivisions, between government and private property. Both states are in the throes of trying to resolve this issue today. However the question of how resources are to be managed is resolved, though, three fundamental principles should be adhered to:

1. Towns should continue to have the authority to make decisions about land and water use which have local significance. Moreover, any town affected by a decision made elsewhere should have a say in that decision.
2. When a land or water use decision has greater than local effects, regional (or in Rhode Island, state) general policies and standards set by the state should apply.
3. The state should exercise decisively its direct planning and regulatory authority in decisions which will affect the entire state.

How these principles are emphasized will vary somewhat depending on what each state decides will be the way decisions are to be made in the future. Ultimately the final decision will be made through the political process, where it rightfully belongs. The SENE Study has looked at a number of different approaches for strengthening the management of our natural resources. As both states are trying to find ways to set aside those lands which they consider environmentally and—in the case of Rhode Island—economically “critical”, one thing the Study did was to examine four different ways governments control the use of such lands. They range from major local control to major state control and are summarized below:

1. **State development guidelines for use by local government.** Each state would pre-

pare advisory guidelines for developments of greater than local impact, which would be applied in local and state development decisions.

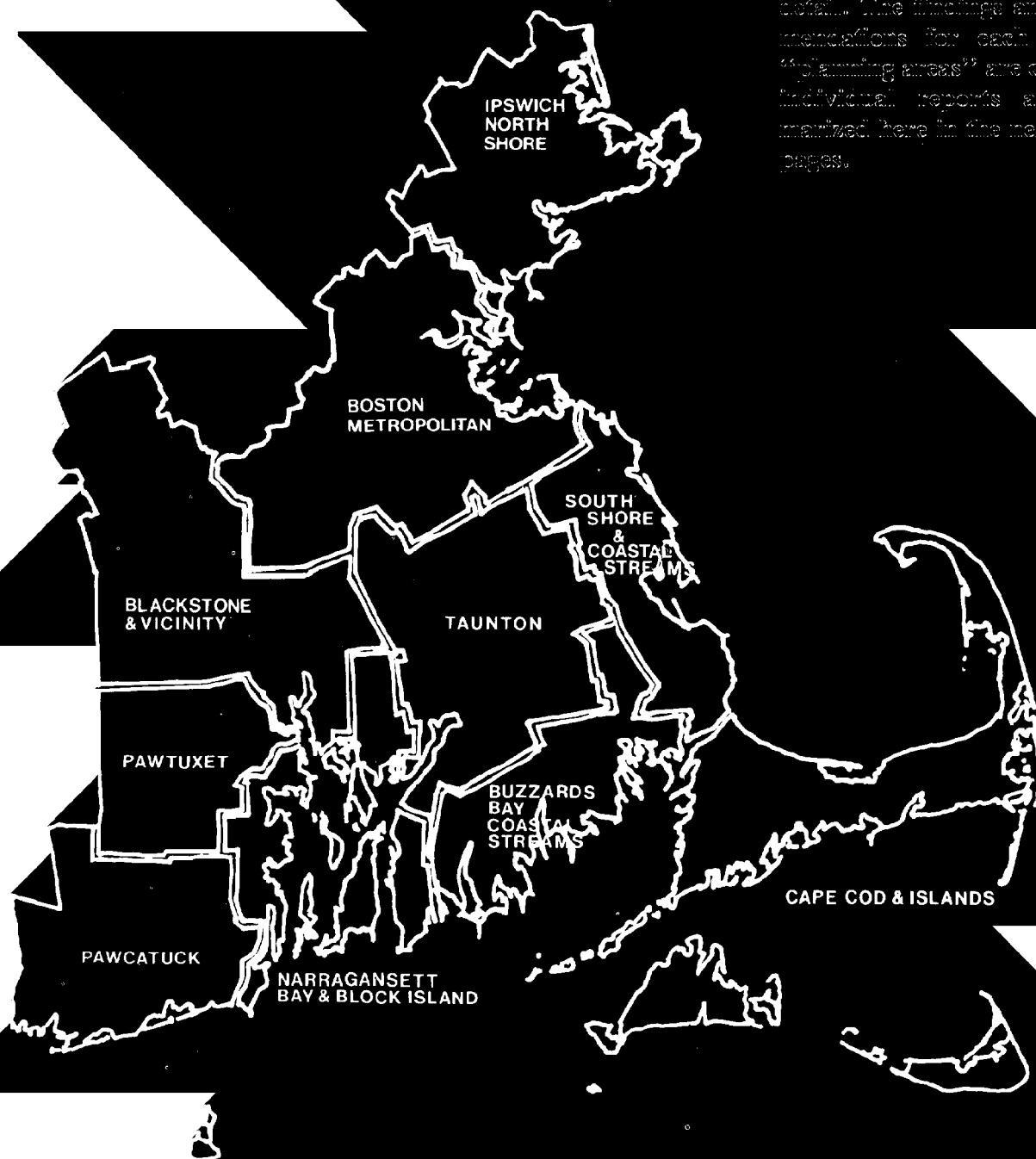
2. **Mandatory local planning and zoning.** Every town would be required by law to adopt a development plan, consistent with state criteria, and regulate development according to the plan. State and regional action would be guided by the local plans.
3. **State designation and local regulation of critical areas.** The state would indicate those areas it considers “critical” and towns would regulate development in those areas based on state guidelines. Should they fail to do so, the state or a regional body would make the decision for them.
4. **State or regional regulation of critical areas with municipal administration.** The state (or regional body) would designate critical areas, establish regulations, for their protection, and supervise their administration by municipalities. Where a municipality refused or was unable to perform, authority would move to either the regional or state level.

In addition to these forms of growth management, the SENE Study also investigated a number of state and regional comprehensive programs for managing water resources which would, among other things, influence the patterns of growth, and gave special attention to a method for integrating the long-range planning authority of Rhode Island's Water Resources Board with that of the Statewide Planning Program.

The four forms of growth management are neither unique nor exclusive. There are many options in between. Of the four, however, it is important to note that clear public preference has been voiced for the last approach, “state or regional regulation with municipal administration.”

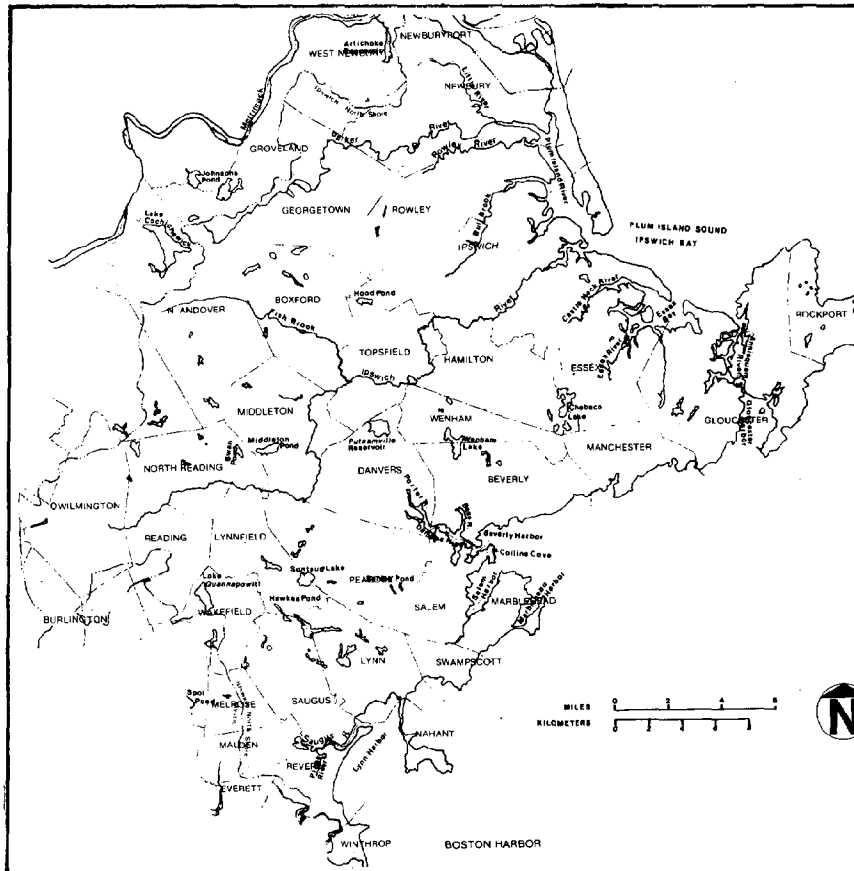
Closer To Home

In addition to examining the natural resource problems and opportunities of the Southern New England region as a whole, summarized in the preceding pages, the Study divided the region into ten sub-areas and examined them in even greater detail. The findings and recommendations for each of these "planning areas" are covered in individual reports and summarized here in the next several pages.



1. Ipswich-North Shore

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Located in the northeastern corner of Massachusetts, the Ipswich-North Shore planning area covers 428 square miles (270,000 acres). It is situated roughly north of Boston and south and east of the Merrimack River. The thirty-two towns in the planning area are:

Beverly; Boxford; Danvers; Essex; Georgetown; Gloucester; Groveland; Hamilton; Ipswich; Lynn; Lynnfield; Manchester; Marblehead; Middleton; Nahant; Newbury; Newburyport; North Andover; North Reading; Peabody; Reading; Revere; Rockport; Rowley; Salem; Saugus; Swampscott; Topsfield; Wakefield; Wenham; Wilmington; Winthrop.

Burlington and West Newbury are "fringe towns."

The area is known for its rolling low hills and rocky outcroppings, meandering small rivers and salt marshes. The most important rivers are the Ipswich, Saugus-Pines, and Parker Rivers. The southern coast is rugged and rock-bound, while the northern coast is protected by Plum Island, a barrier beach.

In 1970, the population was 580,000—the third largest of the region's ten planning areas—having climbed about 70,000 since 1960. In density (2.1 persons per acre) it was second only to Boston. In the next 20 years it is expected to grow at a rate nearly double that of the rest of the region, and the population is likely to reach 770,000, some 30 percent higher than the 1970 size.

The North Shore's reputation for coastal beauty and planned colonial villages is threatened by the dense press of people and commerce creeping northward from Boston. In fact, of all planning areas in the Study's jurisdiction, only the Boston Metropolitan area is more heavily urbanized than the North Shore.

Land Tight after 1990

The Study found that there is enough land suitable for development to meet the area's growth needs until about 1990, without having to touch areas important for flood control, water supply, recreation and amenities. But after 1990, the North Shore is going to be in a bind. Almost half of the land which is still unurbanized is unsuitable for most kinds of development—either the soil is unsuitable for septic wastes, or the land is valuable for flood control and for meeting the area's water supply needs.

The 37 percent increase in urbanization on the North Shore in the last ten years was largely contained within Route 128. In the next ten years the greatest development pressure will be felt in the towns immediately north of Route 128, but also as far north as North Andover, Boxford, Georgetown, and Groveland.

Enough of the right kind of land must be available for future development. The Study

has put forth certain basic principles for guiding future growth to ensure this. Among the recommended measures are the clustering of development on those lands identified by a town as being capable of supporting growth and protecting those which are not. In addition, sewer, water, and other municipal services can be planned to direct future development to acceptable areas. The Study's land capability maps will help towns make these decisions.

Reservoir Urged

The North Shore's rapid growth has had an effect on its water supplies too. For some communities, supplying adequate water for the future is a matter of protecting and developing local ground water resources. For communities in the general vicinity of the Ipswich River, the situation is more complicated.

The planning area report for the Ipswich-North Shore area details a number of alternative ways for these communities to augment their existing water supplies. The result of that evaluation is the recommendation that the controversial Reservoir 30-B be developed immediately. The reservoir, which would fall primarily in Ipswich, would serve that town as well as Gloucester, Rockport, Hamilton, Topsfield, Beverly, Salem, and Peabody. Also recommended is the creation of a regional

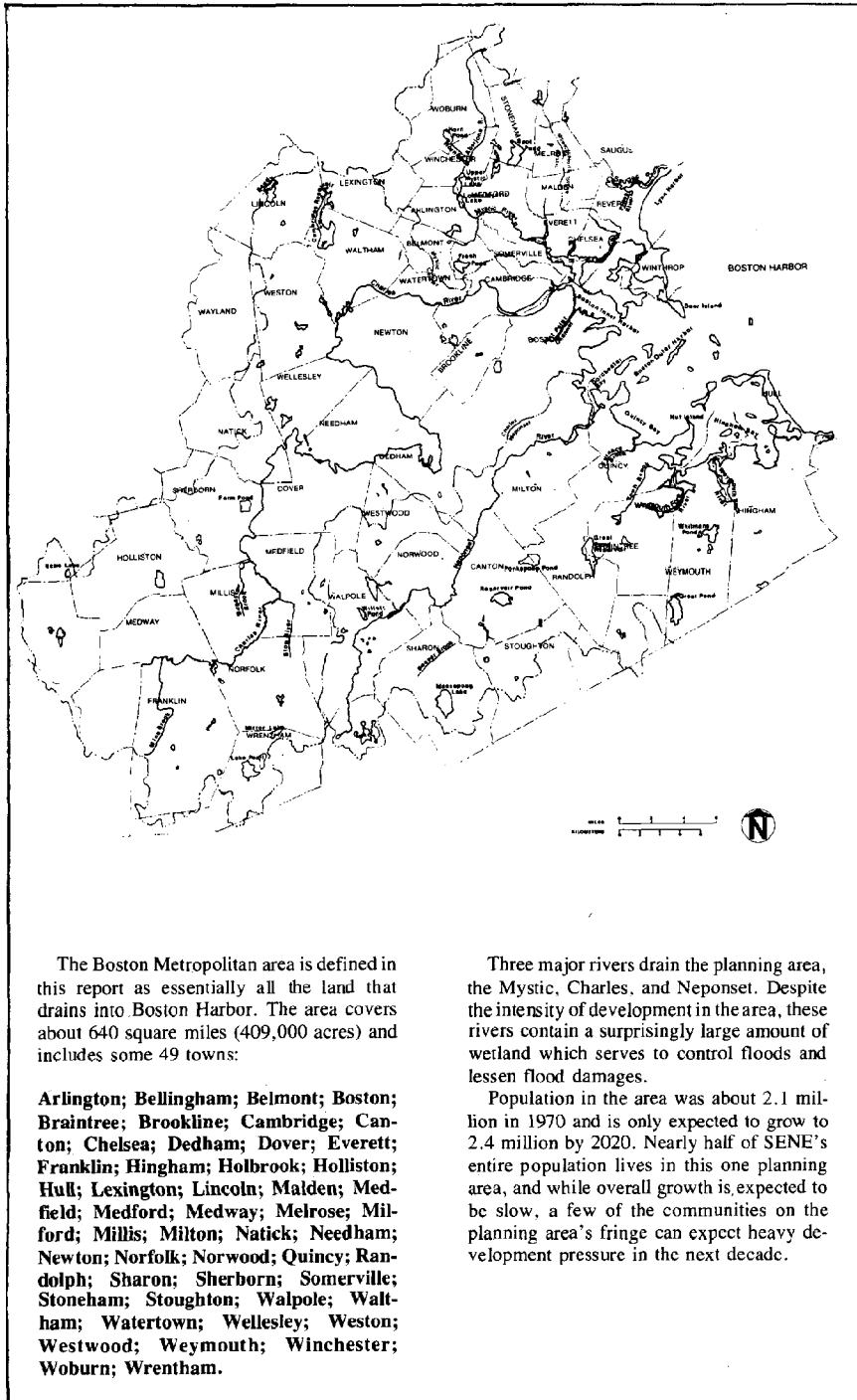
water management agency to protect the water quality and quantity in the Ipswich River area.

Scenic River Proposed

The Ipswich River is one of the few remaining relatively unspoiled rivers in Southeastern New England. In addition to its special attraction as a recreational resource, the Ipswich and the many wetland areas which border it serve to control flood waters and keep flood damages in neighboring communities to a minimum. To ensure that the river continues to serve these valuable functions, the Study urges immediate action by the State to include the Ipswich as one of the first of the state's "scenic rivers." Legislation providing for scenic river designation has been on the books for some time, but the state has not as yet acted to apply it.

Dozens of other recommendations in the Ipswich-North Shore report cover such subjects as improving public access to the coastline, expanding and improving transportation to some beaches, waterfront improvements in some of the area's major port communities, and improving the management of the area's rich shellfish beds.

2. Boston Metropolitan



Densely urban for decades, the Boston Metropolitan planning area does not face the same intense pressures for future development as some of the more suburban areas in SENE. The area, with its western boundary falling generally between Routes 128 and 495, does contain some of Boston's "bedroom communities;" and growth has been steady, if slow.

Good Land Remains

A surprisingly large amount of open and even scenic land still exists in and around Boston. With growth expected to level off by 2020, it appears that the available developable land will be sufficient to meet the area's growth needs. However, unless the particularly scenic areas—along river banks, around water supply reservoirs and elsewhere—are protected, there is a real threat that future growth will engulf them.

Urban living is, by definition, crowded, but there is no reason why the landscape must be bleak. The Study's Boston Metropolitan planning area report details steps which can be taken today to accommodate future growth without sacrificing the few natural and scenic areas left in the city and its environs. One recommendation even offers the opportunity of decreasing the cost of future growth to the taxpayer. Preliminary studies indicate that existing and proposed sewer services in the metropolitan area exceed the expected peak population considerably. If a conscious planning effort were made to direct future growth to those areas already served by these services, a major public expenditure—the cost of installing new capacity—could be saved. With urban finances what they are, this "excess capacity" offers a special opportunity.

Water Shortage a Legacy of Growth

One of the major victims of the Boston Metropolitan area's past growth has been its water supplies. Development, and its by-product pollution, have to a large extent limited the usefulness of local sources of ground and surface water in many core communities. Today, the Metropolitan District Commission provides for the water needs of 23 of the metropolitan area's communities, with water gathered primarily from Quabbin Reservoir in the center of the state. In fact, the MDC provides nearly half of all the water used in the entire Southeastern New England region.

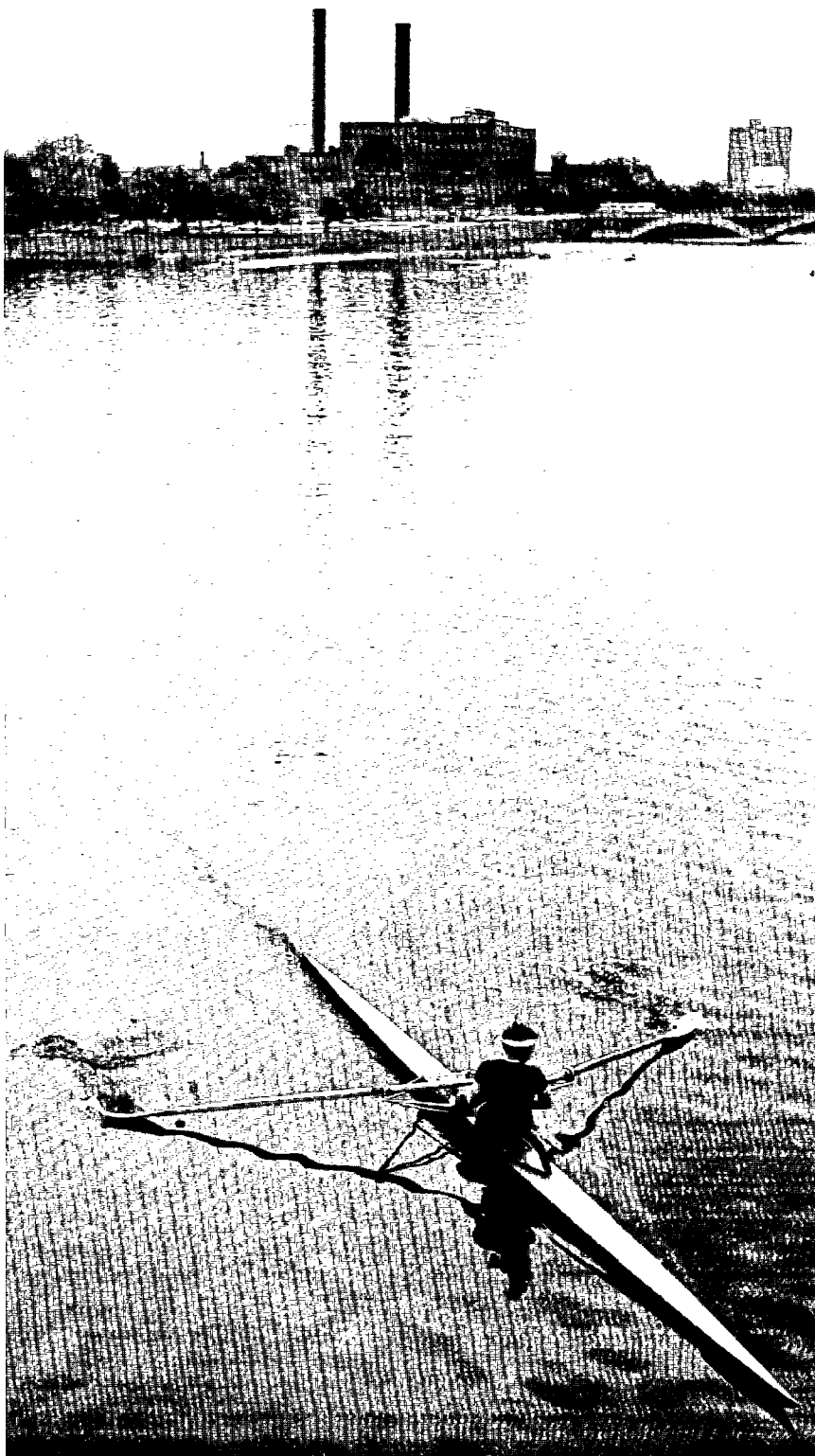
However, the MDC system's existing dependable water yield is already overtaxed, and the MDC is having trouble meeting the needs of its current customers, much less those communities which would like to join.

In perhaps the most comprehensive search for additional water done to date, the Study found the presently most feasible strategy to meet the metropolitan area's water needs: in-

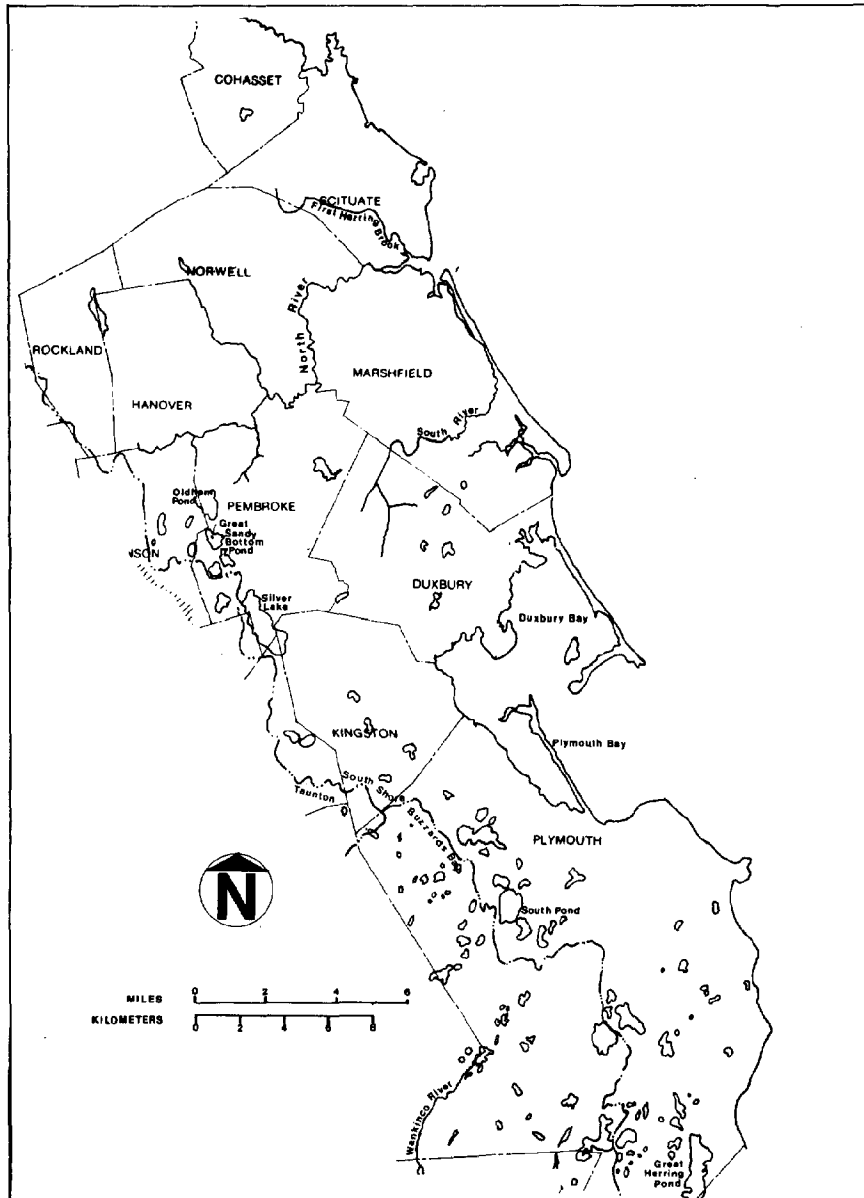
tensive water conservation and immediate completion of the controversial diversion of water from the Connecticut River at Northfield Mountain. Also recommended was further planning for another diversion from the Connecticut River basin, the Millers River, subject to conditions dealing with water rights of downstream states, the evaluation of environmental, social, economic impacts and in-basin needs, and others. While everyone agrees that it is not an "optimal" solution, it appears to be the only one currently available. Nevertheless the Study encourages more detailed evaluation of the alternatives considered, including sources from the Merrimack River, the Upper Sudbury River, desalination, and wastewater reuse.

Making the City More Livable

One theme runs consistently throughout the dozens of recommendations in the Boston Metropolitan planning area report—that the many unique opportunities for making city living attractive in the Boston area be seized at once. Principal among them is an endorsement of the Commonwealth's plan for developing the recreational potential of the Boston Harbor Islands and providing affordable transportation to these islands for thousands of city dwellers. Also recommended are proposals to improve the transportation links between the city and North and South Shore beaches, accelerating the rehabilitation of the metropolitan area's waterfront properties and city recreation facilities, and the designation of portions of the Charles River as an initial element of the State's scenic river program.



3. South Shore



The South Shore coastal planning area, located south of metropolitan Boston has a total area of some 270 square miles (172,000 acres). In some ways it mirrors the geography of the coast north of Boston, with rocky coast nearest to the city, moderate to gentle rolling hills and sandy beaches to the south, ending in towering bluffs facing Cape Cod. Ten towns are included in the planning area:

Cohasset; Duxbury; Hanover; Kingston; Marshfield; Norwell; Pembroke; Plymouth; Rockland; Scituate.

The South Shore's coastal resources, its

beaches, harbors, estuaries, and coastal rivers are its most valuable natural assets. The two principal rivers the North and South, are exceptionally clean. But the growth these assets have attracted may make them liabilities. The best available statistics indicate that the area's population of 116,000 people will more than double by 1990, to 238,000, possibly doubling again by 2020.

Population density already exceeds 1500 people per square mile in the northern part of the planning area, and is nearly 1000 per square mile along the coast. Many of the area's new residents have built on high-hazard flood lands.

The South Shore is rapidly running out of room to grow. It is a classic example of what can go wrong when highway construction and rapid residential and commercial development go unplanned.

From Farmland to House Lots

In the past ten years, the South Shore area grew an incredible six and a half times faster than the rest of Southeastern New England. In all, urbanized land increased 70 percent in the last decade. Some 30 percent of the South Shore's farmland was carved into house lots.

The spectacular growth experienced by South Shore communities is not unique. It is a nationwide phenomenon and has been variously described as "the flight to the suburbs" or, more graphically, "spread city." People in communities throughout the South Shore have begun to realize that the blessings from the prosperous sixties are mixed. The highway that would speed them to work and home again is choked with traffic. The open spaces they sought have been replaced by massive shopping centers and acres of asphalt. The low tax bills on their homes have skyrocketed as towns struggle to provide services to their burgeoning populations. And they are running out of water.

The seriousness of the land crunch in the South Shore is masked by an apparent abundance of open land. But it is an illusion. The SENE Study's land resources inventory has discovered that less than half of the remaining land is suitable for development. Either the slopes are too steep and the soil unable to accept septic wastes, or the land is valuable for flood protection or for sustaining the area's already endangered water supplies. Much of it is already protected wetland. The remainder apparently could accommodate growth only until roughly 1990, if land consumption continues at about one acre for every additional three people.

Solutions are difficult. Calling for a moratorium on development is a popular but unworkable remedy, especially in light of the transportation improvements planned from Boston to the South Shore. The South Shore Planning Area Report outlines a pragmatic strategy for protecting certain fragile lands and guiding growth to lands most capable of supporting it. More efficient forms of development, such as clustering, are advocated, especially for towns experiencing high development pressure—Plymouth, Duxbury, Marshfield, Pembroke, Hanover, Norwell, Scituate, and Cohasset.



Regional Water District Urged

Several South Shore communities are critically short of water. The availability of water, and municipal improvements needed to make it available, can be a powerful growth guiding tool. One of the Study's principal recommendations is that future growth should be directed to areas already served by such municipal "infrastructure" as water, roads, and sewers. Also municipalities should plan expansion of such services and ensure that new growth occurs only in those areas.

The development boom of the sixties has had a profound effect on the quality of both the drinking water and the streams and rivers in the area. A few towns appear to have sufficient water to meet their needs for the future, and Plymouth has a surplus. There are a few attractive sites for small intermunicipal reservoirs too. To help these communities plan future water supplies and manage what they have today, the Study recommends that a South Shore Water District be formed.

Waste Water Recycling Project

Strong support was expressed at public meetings held by the Study throughout the region for the process of spreading treated waste water on open farm and forestland—a process called the "Living Filter" for the way it purifies water as it percolates through the soil to the water table. Located near the ocean, ground water resources in several South Shore communities are susceptible to sea water intrusion. One of the Study's most exciting recommendations is that a federal-state feasibility study for land application of waste water be undertaken immediately.

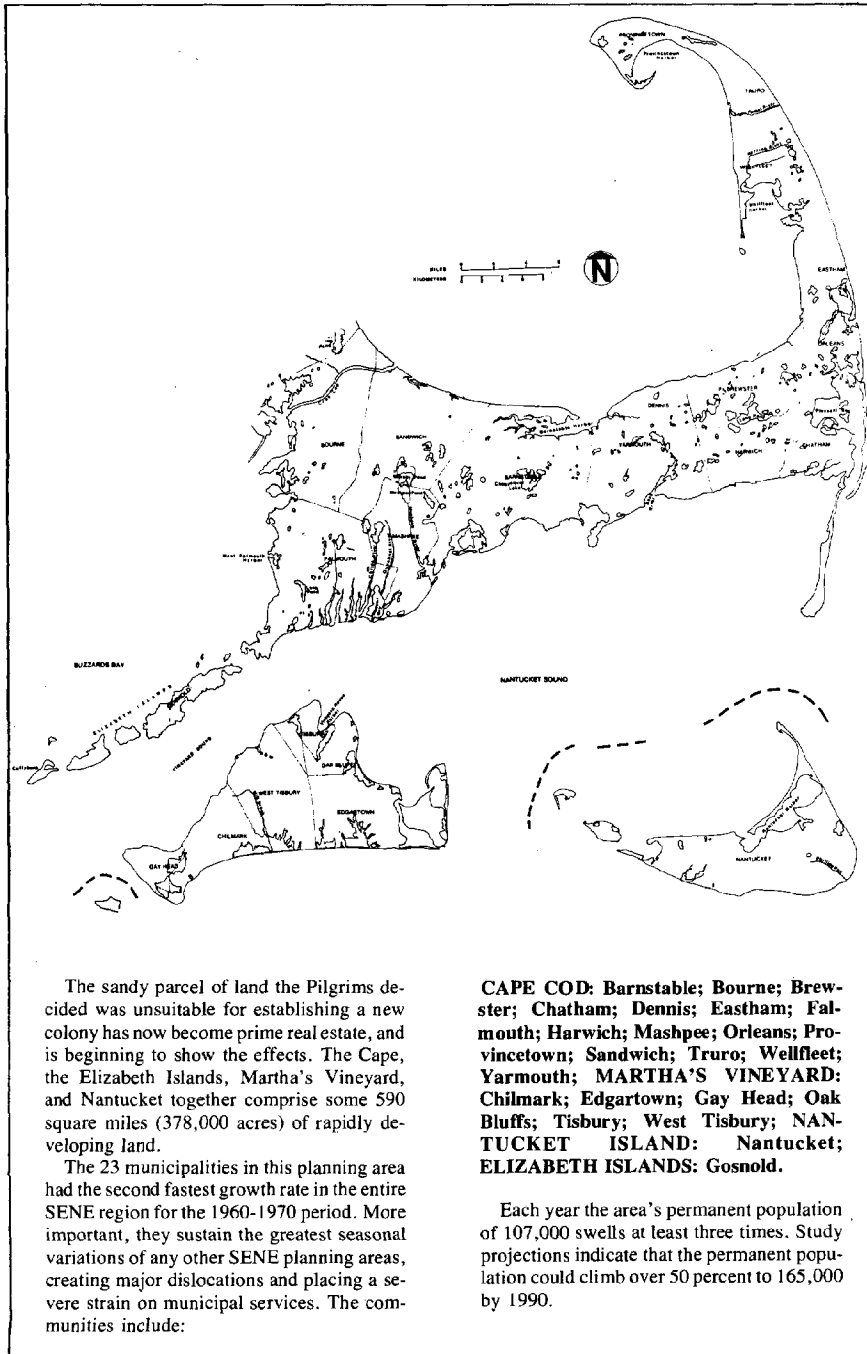
Outstanding Recreation Opportunities

While the South Shore is running out of options for accommodating future growth, the picture is much less bleak for meeting future recreation needs. The area's abundance of salt marshes and wetlands ensures that some open space will always be available. Its many beaches appear more than able to meet future swimming needs, both local and regional. But

two natural features stand out. Duxbury Beach and the North and South Rivers. Duxbury Beach's private owners and the nearby Gurnet-Saquis Corporation, have been doing an outstanding job of protecting and maintaining this barrier beach and at the same time providing for public use. As a result, the Study supports continuation of the present management system for the time being, and encourages the towns of Duxbury and Plymouth to continue to assist the Beach Association in patrolling and protecting the beach.

The Study also urges that the historic and unspoiled North and South Rivers be designated as initial elements of the Commonwealth's state scenic river program. These two rivers are among the cleanest in the state. From their colonial shipyards came the Boston Tea Party ship "Beaver" and the first American ship to sail around the world, the "Columbia." They are seriously threatened by pressure for development from all sides and could provide a unique recreational experience for the area's population if protected now.

4. Cape Cod and the Islands



It is perhaps Southeastern New England's most precious natural asset, a coastal mecca for the entire Northeast. It is a landscape of intense contrasts, of sleepy colonial villages and sprawling retirement communities, of exclusive summer estates and garish strip development. Its economy is booming. And its activity may all simply grind to a halt for lack of water.

Water Supply Situation Critical

The economy of Cape Cod and the well-being of both its permanent and seasonal populations rests, literally and figuratively, on its fresh water supply. Both the economy and the population show every sign of continued growth. Water demand for the Cape's underground water supply is increasing at a rapid rate and could soon reach its limits. As demonstrated in other parts of the region, the quality of the aquifer, if forced to accept increasingly heavy pollution loads, will deteriorate. Also, with each new withdrawal the threat of salt water intrusion into aquifer will increase. And the same situation exists on Nantucket and Martha's Vineyard.

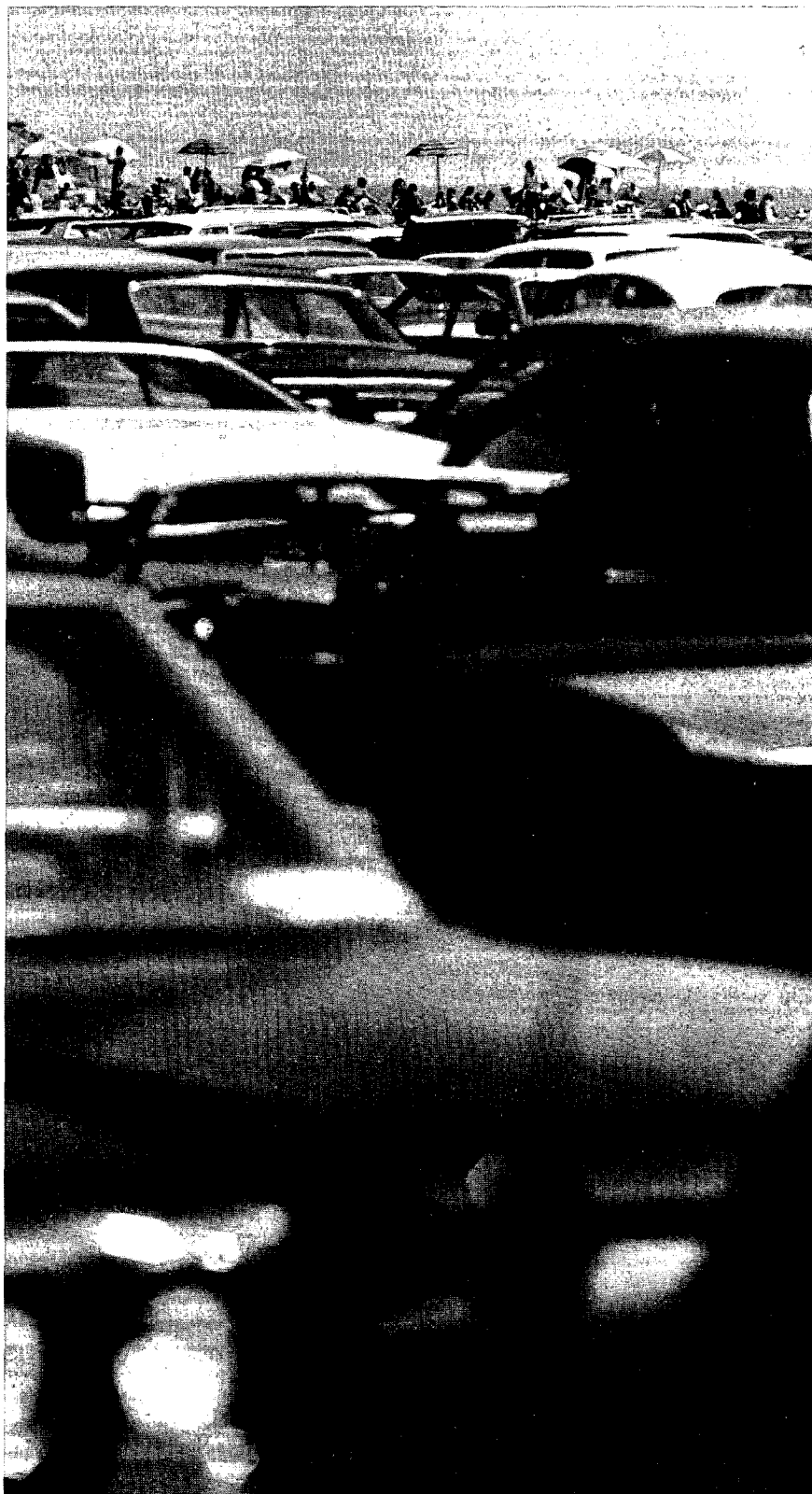
The water supply situation requires coordination among water authorities throughout Barnstable County and parts of Dukes County, to maintain an adequate water supply of good quality. The SENE Study urges the immediate creation of two regional water management agencies—one for Cape Cod and one for Martha's Vineyard—to coordinate the development and management activities of all the municipalities and local water authorities. The idea has been around a long time, and its time has come. Whether it functions as part of an existing regional body, or independently, it should carefully monitor withdrawals, determine the position of the salt water/fresh transition zone, study ways of augmenting the water supply, and help decide appropriate locations for waste disposal.

Land Use Key to Clean Water

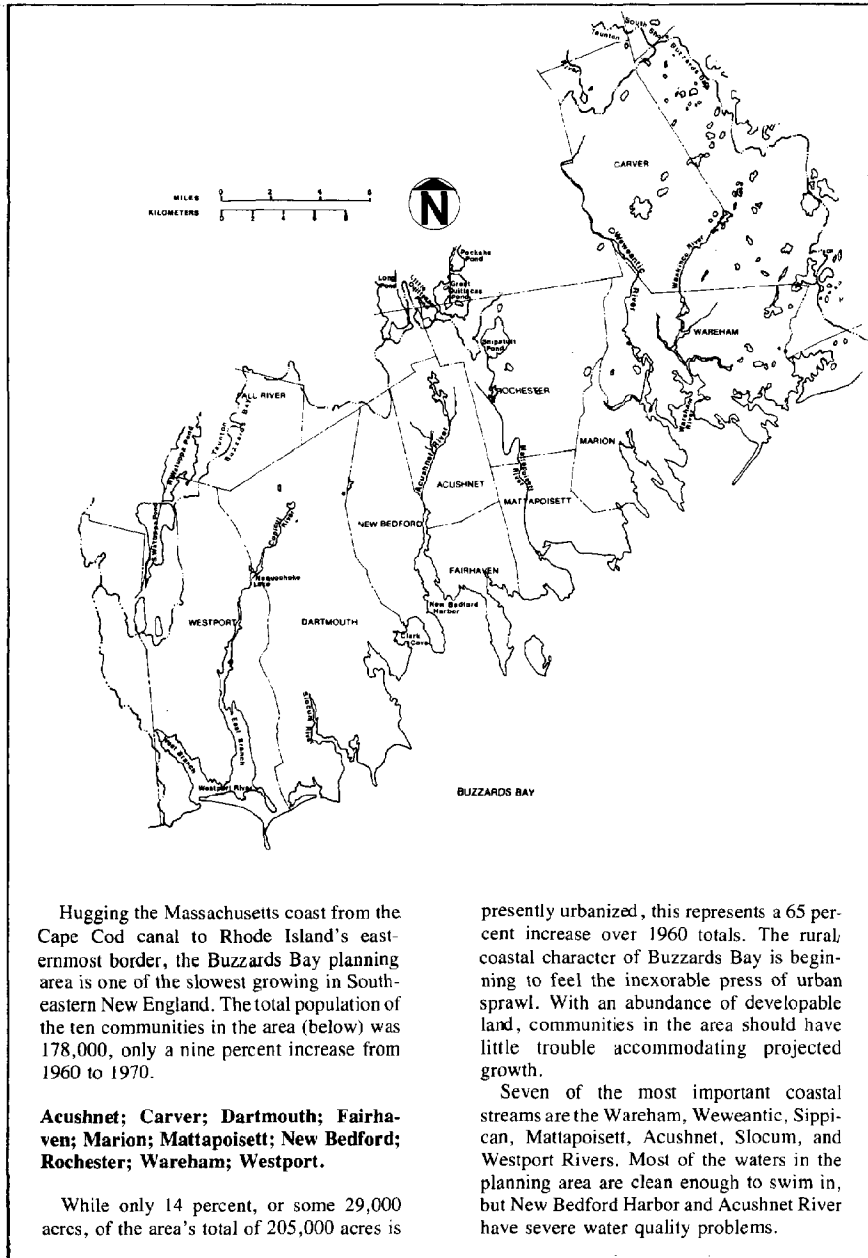
The key to protecting the water supply underground, of course, is to do a better job of siting new developments above ground. The Cape and Islands grew nearly four times faster than the rest of the region in the period between 1960 and 1970. During that decade, urban land increased more than 40 percent. And it does not appear to be tapering off. Even the most conservative projections show the population more than doubling by 2020. Moreover, improvements planned for major highways to the Cape will even further aggravate the area's seasonal growth problems, requiring more and better municipal services. The Study recommends a series of steps towns should take to ensure that future growth is guided to those lands most capable of supporting it, with a special eye towards protecting the fragile water supply. In

addition, it urges that the Cape Cod Joint Regional Transportation Committee undertake, as part of next year's work plan, studies of the feasibility of mass transit systems on the Cape, reinstatement of rail service from Boston, bus service to the seashore from major highways, a ban on non-local automobiles on Nantucket and Martha's Vineyard, and a system of bike trails, all to reduce the tremendously negative impact of traffic congestion and highway construction.

Among the dozens of other recommendations for the Cape and Islands in the planning area report are wiser use of existing marina facilities, the dredging of selected recreational boating channels, providing state assistance for local shellfish management, and research into the potential for aquaculture in some of the Cape's estuaries.



5. Buzzards Bay



Buzzards Bay is a quiet, almost isolated corner of the Massachusetts coast, an area which has grown slowly in the past decade. For hundreds of years the economic health of the communities along this ragged coast has mirrored the health of the commercial fishing industry. The sluggishness of development in recent years parallels the deceleration of the port of New Bedford. But that may all be changing.

Modest Growth Locally Controlled

The nine percent increase in population from 1960 to 1970 in the Buzzards Bay area was one of the smallest in Southeastern New England. The development it stimulated appears to have been dispersed throughout the cities and towns in the area. In absolute numbers, the City of New Bedford registered the greatest population growth in the area in the ten year period—only 2600 people.

With such a slow rate of growth, Buzzards Bay communities have a better opportunity than most parts of the SENE region to protect the vast wealth of natural areas—salt marshes and wildlife areas, beaches and coastal streams. While recognizing a need for economic growth some communities have demonstrated a large concern for where they will allow it to occur. Westport and Dartmouth, for example, are making vigorous efforts to guide new development away from beaches, dunes, and estuaries by means of zoning and the acquisition of property or easements.

Federal Action to Help Fishing Industry

A predominating influence on this slow pace of growth has been the troubled fishing industry. The situation stems from circumstances both within and without immediate geographic boundaries. The truth is, the entire American fishing fleet is struggling to compete with better equipped foreign fleets. Moreover, the virtual absence of control on the major fishing grounds has resulted in one species after another being "fished out." The SENE Study joins those who call for an interim 200 mile economic zone to protect what few species are left until an acceptable management program can be hammered out by the Law of the Sea Conference.

Perhaps to a greater degree, however, the fishing industry's most pressing problems are at home, not out on Georges Bank. Their business has been marginal for years and, as a result, they have been unable to modernize. And while the prime fish species have nearly disappeared, America's appetite for them has not. So the Study urges a number of steps be taken from the federal to the local level. Among the recommendations are establishing a national fisheries management program which would allow foreign entry, enforcing quotas, controlling species and seasons and establishing fishing gear specifications.

Also recommended are programs to improve the marketability of new fish species, state assistance to local planners to better accommodate fishing industry facilities, and repeal of the act prohibiting the purchase and importation of foreign-built vessels.

Oil Development: The New Challenge

Some new faces have been seen down around the docks in New Bedford and in several other port cities in Southeastern New England. And their speech is colored not by the flat "a" of New Englanders, but with the broad "a" of Texans. They are oil men, and they are looking for harbor space, storage areas, office space, and hotel rooms. They are casing New Bedford's ability to support a service and supply base for offshore oil drilling. For the fishermen, for New Bedford, and for the entire

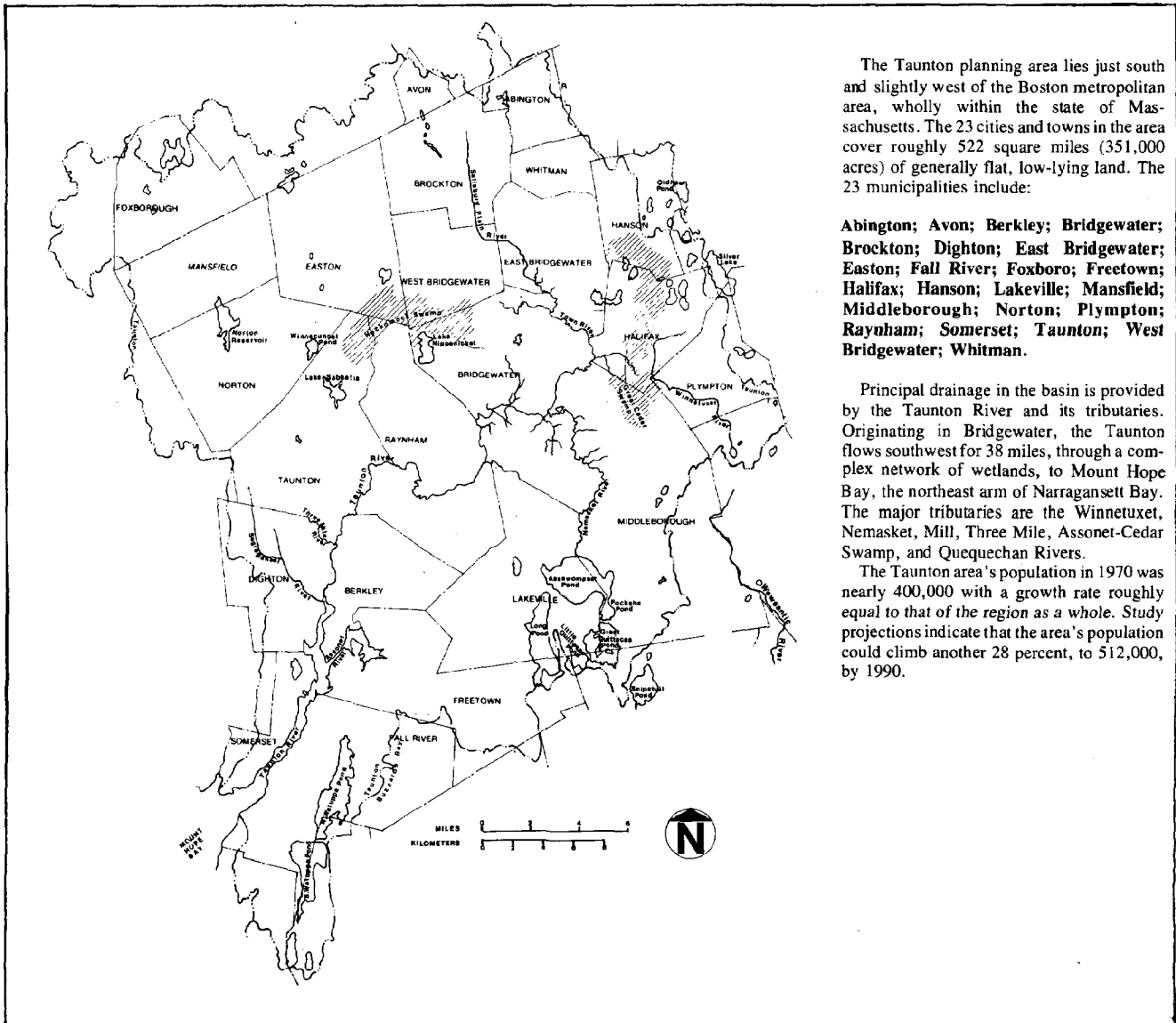
Buzzards Bay area, the coming of the oil men is a threat, and an opportunity.

Oil development could revitalize the port, provide some jobs and taxes, and might even attract new development. It could also end up shouldering the already weak fishing industry aside in the competition for dock space and labor. And in a few years it could be gone again, leaving the bill for housing, schools, and other municipal services as a reminder. According to information developed by the SENE

Study, there appears to be enough land to support such development. There may even be enough water. But none of the municipalities in the Buzzards Bay area is fully capable of dealing independently with oil industry developers on an issue of such regional importance. As a result, the Study recommends that state policy makers—particularly coastal zone management and energy planners—participate fully in any decisions on the siting of facilities related to offshore oil development. The fishing indus-

try has supported residents of Buzzards Bay for over 300 years. Georges Bank oil and gas resources could be exhausted in less than a decade. Both industries are vital. Both should get the careful planning they deserve.

6. Taunton



The Taunton planning area is big, rural and wet. In fact, there are so many ponds, swamps and bogs that for years many have thought that the only thing this soggy landscape was good for was raising cranberries. But they were wrong. The wetlands which drain to the Taunton River are vital to the present and the future of the 23 communities in the area.

Plenty of Room For Growth

Despite the fact that it is home for such major cities as Taunton, Brockton, and Fall River, more than 80 percent of the Taunton planning area is open space—forests, farmland, wetlands, and open water. There are more of what the SENE Study defines as "critical environmental areas" in this planning area than any other in the region. Yet while the area's character is largely rural, it has hardly been overlooked by developers. In typical fashion, a significant amount of new development occurred in the last decade on the heels of major improvements in highways. Urbanized land increased 60 percent between 1960 and 1970.

There is even a possibility that commercially developable coal deposits may exist in the area. Certainly, if coal resources prove worthy of development, there would be significant primary and secondary impacts on the growth of the region and the quality of the environment.

As it turns out, there is plenty of land available in the Taunton planning area to meet projected growth needs even through 2020. But much of the developable land lies less than 20 feet above surrounding wetlands and flood plains. To protect these resources, and to protect the investments of its residents, future development will have to be closely monitored and carefully done. The Study report details a series of steps to guide future growth to achieve these goals.

Water Supplies Fragile

Because of their constant proximity, there are few places in the SENE region where the intricate interrelationships between land and water are more apparent than the Taunton area. Everything that happens on the land is mirrored in the quality of the water and has an impact on the availability of drinking water, the opportunities for recreation, the abundance of wildlife, and the vulnerability to flooding.

Outside of the major cities, ground water is the major source of water supply, and many residents are sensitive to how quickly it can become contaminated. They thwarted a proposal to extend interstate highway 495 through Hockomock Swamp largely because of the threat that their drinking water supplies would be polluted by highway deicing salts. The protection of the area's swamps and ponds is also critical to surface water supplies. Taunton planning area communities are linked by a



complex arrangement of surface water bodies, water diversions, and water withdrawal agreements. With a few recommended adjustments and strict protection of the quality of these sources, it appears that they can continue to serve the area's needs. One of the Study's principal recommendations is the creation of a regional water authority for Taunton, Dighton, Raynham, Foxboro, Mansfield, Norton, Middleborough, Attleboro, and North Attleborough to develop and plan both water supply and water quality management programs. Their first order of business would be diversion of water from Fall Brook in Lakeville to Assawompsett Pond to, among other things, meet the projected 1990 water needs of member towns. Several of these towns will be under high development pressure in the next decade.

Keeping Flood Damages Down

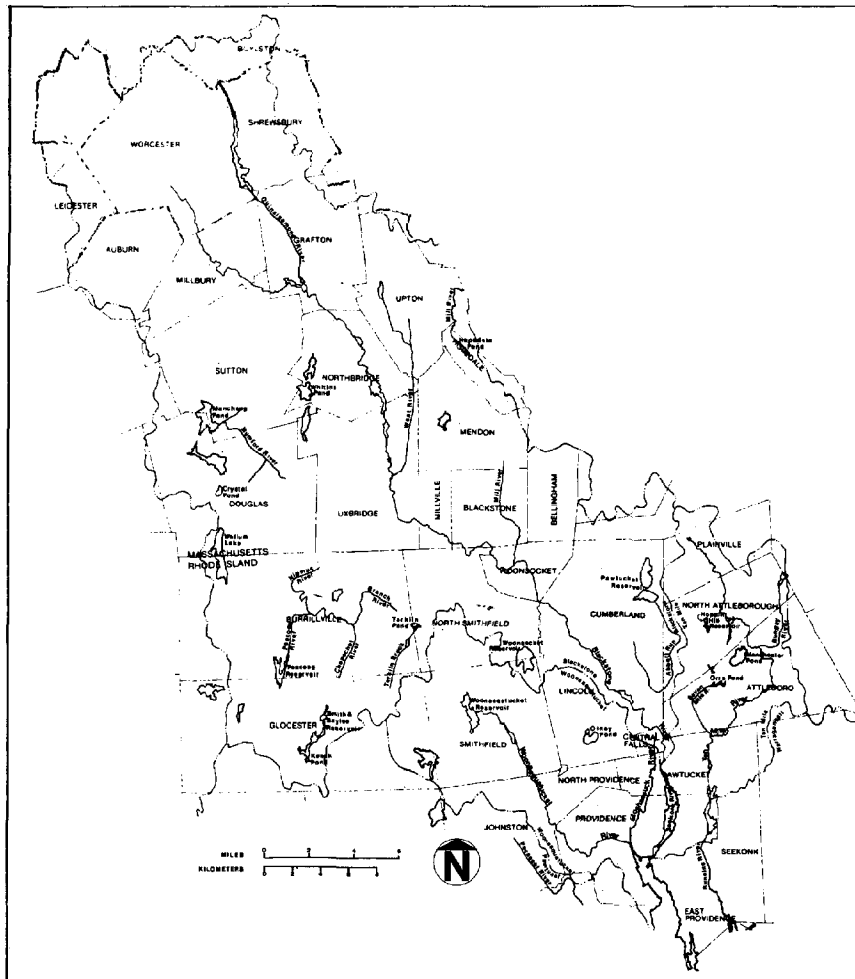
The Taunton area's vast network of wetlands has also been critical in keeping flood damages

down in the past. The entire region is very flat and highly susceptible to flooding, but the wetlands and ponds retain excess flows, releasing them slowly, and reducing the danger of flooding. Where upstream wetlands have been filled, as in the case of Brockton, damages have increased dramatically. The Study recommends that the Corps of Engineers, working with state and local agencies, develop a flood plain management program for the entire Taunton River basin.

One way to protect portions of the Taunton River for flood prevention, conservation, and recreation purposes is to use the state's scenic river legislation. The stretch between Bridgewater and Taunton seems to be the most appropriate for designation. The Department of Environmental Management should implement immediately this dormant legislation, including the Taunton as a component of the scenic rivers system.

7. Blackstone and vicinity

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The Blackstone and Vicinity planning area consists of the land in Massachusetts and Rhode Island that eventually sheds water to Providence Harbor. The area covers about 640 square miles (410,000) and 30 cities and towns in south-central Massachusetts and northern Rhode Island:

MASSACHUSETTS: Attleboro; Auburn; Blackstone; Douglas; Grafton; Hopedale; Mendon; Millbury; Millville; North Attleborough; Northbridge; Plainville; Seekonk; Shrewsbury; Sutton; Upton; Uxbridge; Worcester; **RHODE ISLAND:** Burrillville; Central Falls; Cumberland; East Providence; Glocester; Lincoln; North Providence; North Smithfield; Pawtucket; Providence; Smithfield; Woonsocket.

Four major rivers drain in the area: the Blackstone, Ten Mile, Woonasquatucket, and Moshassuck. The Blackstone originates in Worcester and flows in a southeasterly direction to its mouth in Pawtucket, where it becomes a tidal estuary known as the Seekonk River.

Nearly 20 percent of SENE's population lives in the major cities in this planning area. The population, however, increased only two percent, from 810,000 to 824,000, in the sixties, making it the slowest growing area in the region. According to projections, the population will continue to grow slowly, to 886,000 by 1990 and 920,000 by 2020. Most of this growth can be expected in suburban areas as urban centers decline, reflecting national trends.

The area drained by the Blackstone River and three others cuts a broad swath from Worcester to Providence. The major cities along this corridor were in the forefront of New England's early industrial revolution. Linked by the river, and later by the railroads, these towns prospered and became major industrial centers. But that was a long time ago, and things have changed some since then.

Declining Cities, Expanding Suburbs

The population growth rate in the Blackstone area was the lowest of all the area in South-eastern New England—two percent. New urbanization was the second lowest. From the generalized statistics, growth in this huge section of the region would appear to be at a near standstill. But the figures mask the true picture.

The four largest cities, Worcester, Woonsocket, Pawtucket, and Providence, lost much population during the sixties, the decreases related to the decline in manufacturing jobs as old

factories cut back or closed down. At the same time, some of the suburban areas actually grew relatively rapidly, with land consumption equal to the average for the region as a whole.

Based on the modest growth rate of the last decade, there should be little difficulty accommodating future growth. A large amount of land suitable for development exists in the area and if growth is guided to these lands, what is left in the way of critical environmental areas should be relatively easy to protect. It will take a conscious effort on the part of each community, however, to make this happen. The expansion around Worcester is a case in point. The decline of the inner city and expansion on the fringes has placed a difficult burden on municipal finances. With excess capacity in water and sewer services growing in the city, funds are being poured into still more municipal services on the edges of the city and in surrounding communities. One of the Study's principal recommendations is that new development be

guided to areas already served by water and sewer lines. With the prospect of revitalizing the cities and reducing the burden on surrounding communities, guiding growth in this manner could have a salutary effect on the area's economy. At the very least, it would not burden it further.

The Ever-Present Flood Hazard

The Blackstone area has one of South-eastern New England's most serious flood problems. In fact, high flood damages are a legacy of the industrial revolution. Much of the industrial, commercial and even residential development which occurred in those days hugged the river banks. The river was, after all, a power source, transportation system, and water source. As upstream wetlands were filled and the river's flood plains developed, flood damages rose. In the Blackstone River basin alone, damages from Hurricane Diane in August 1955 were nearly \$68 million. In the aftermath, a

number of flood control projects were constructed. However, development has continued in the basin's flood plains and, despite the flood control projects, a recurrence of the 1955 flood would cause an estimated \$30 million in additional damages.

The key to ending this cycle of damage, protection, development, and new damage—and a major recommendation of the Study—is to identify and protect the area's flood plains and upstream flood-retaining wetlands. Experience shows that it is fruitless, in most cases, to build structures designed to keep floods away from people. The answer is to keep the people away from the floods.

Rich Recreation Potential

One way to protect and use flood plains is to develop their recreational potential. With the second highest population in the region, the Blackstone area has high recreation demands which are largely unmet. Some of these demands could be satisfied through innovative uses of wetlands, flood plains, river banks, and water bodies. The Study details a number of recommendations for recreational use of some river areas, including a 16-mile trail from Douglas to Providence, a 51-mile Blackstone River Park, and a recreation complex on the

Ten Mile River. Also recommended is an assessment of the recreational potential of the area's many mill ponds, remnants of the area's industrial heritage.

The many water supply reservoirs in the Blackstone planning area could meet some of these recreation demands, if public access to storage areas for certain limited uses were permitted. At present local water authorities, responsible for the purity of drinking water supplies, have kept water supply reservoir lands "off limits" to the public. The Study recommends that each state join local water authorities and public health officials in developing guidelines for light recreational use of these lands under conditions on which the quality of drinking water is not endangered. New sources of funding for managing these activities must be developed.

The Providence Water Supply System

The Study found that the Providence water supply system, which draws its water from the Scituate Reservoir in the Pawtuxet planning area and supplies communities in several other planning areas, will need additional sources of supply in the near future.

The State has identified a number of alternative sources, among them reservoirs on the Big

and Wood Rivers. The SENE Study endorses the Big River Reservoir, but stops short of recommending that the Wood River Reservoir also be built. According to SENE Study calculations, construction of the Big River Reservoir, if combined with full development of local water sources, will push the need for the Wood River Reservoir far enough into the future that other alternatives, such as desalination, might become more economical.

Not only will the Big River Reservoir be able to serve the Providence metropolitan area, as well as some neighboring communities not yet on the system, but there will be enough water left over to serve the towns of Portsmouth, Middletown, Jamestown, and Newport when those towns need more water after 1990.

8. Pawtuxet

The Pawtuxet planning area is "water rich". That is its principal natural characteristic, one which causes problems as well as opportunities.

Providing Providence's Water

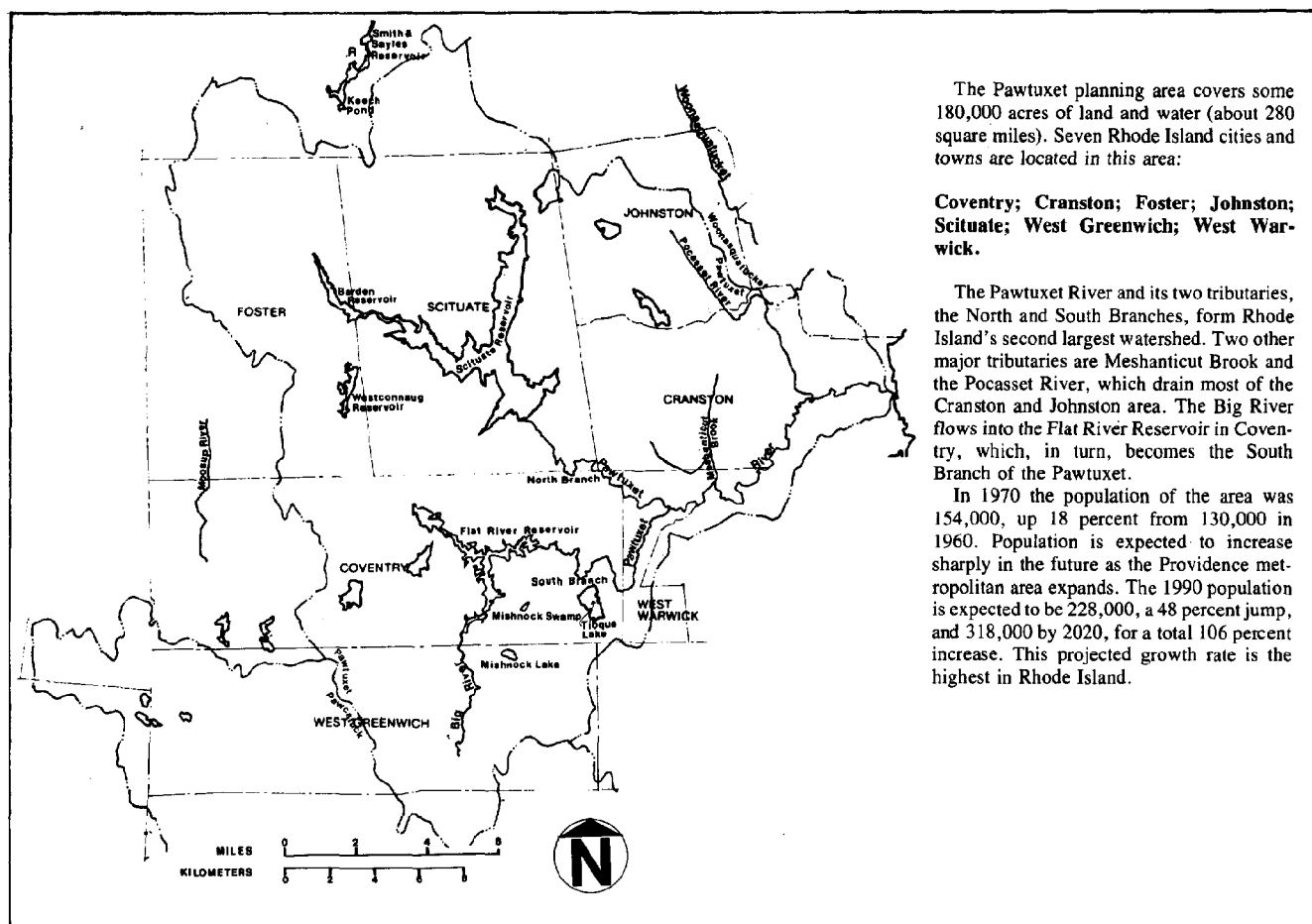
Nearly 20 percent of this planning area is controlled by water authorities, the largest of which is the Providence Water Supply Board. The Scituate Reservoir provides the Providence system with its total yield of 72 million gallons per day. But that is not going to be enough to meet the metropolitan area's increasing needs. The Rhode Island Water Resources Board has recommended, and the SENE Study has endorsed, the development of another reservoir in the planning area on the Big River. The reservoir would supply the Providence metropolitan areas, some neighboring communities not yet on the system, and still have enough left over to serve Portsmouth, Middletown, Jamestown, and Newport after 1990. The state has already acquired the land. The Study feels that the proposed Wood River Reservoir, a second

one considered for the Providence area, can be put off. Meanwhile, alternative means of water supply may become technically and economically feasible.

Ironically, except for Cranston and Johnston, which are served by the Providence system, none of the communities in the planning area draw water from surface water sources. These communities all rely on the area's abundant ground water, served by private wells, or supplies from the Kent County Water Authority.

Controlling Growth To Protect The Water

With the area's water supplies playing such an important role in the future of so much of the state, protecting the quality of those supplies is of paramount importance. And an enormous burst of growth in the last decade has begun to threaten some of those supplies. Between 1960 and 1970, urbanized lands increased over 125 percent, sprawling from 9,000 to 22,000 acres. This rate of growth is nearly three times the average for the region as a whole. Most of this



growth was centered in the eastern part of the planning area, particularly in Cranston, Coventry, West Warwick, and Johnston. Projected future growth will spread steadily westward into Scituate and West Greenwich, encroaching on lands important for ground water protection.

Study findings indicate that there is enough land in the planning area suitable for new development to meet needs through 1990. But after that the area will be in a critical growth bind. To keep new growth away from those lands important for water supply protection, the Study recommends a strategy designed to cluster growth on developable lands and make maximum use of lands already served by water and sewer services.

Critical Water Quality and Flooding Problems

In this planning area there are many examples of what happens when the interrelationships between land use and water resources are ignored. Run-off from development and pollu-

tion loads are so heavy along the lower reaches of the Pawtuxet River that the small and sluggish river will probably never be much cleaner than it is today.

That same heavy downstream development is also the major reason for the area's chronic flooding problem—one of the worst in the entire region. More than 60 percent of the flood plains bordering the main stem of the Pawtuxet River have been developed. With each new development, flood damages increased, most severely where flood waters met with high incoming tides near the mouth of the river.

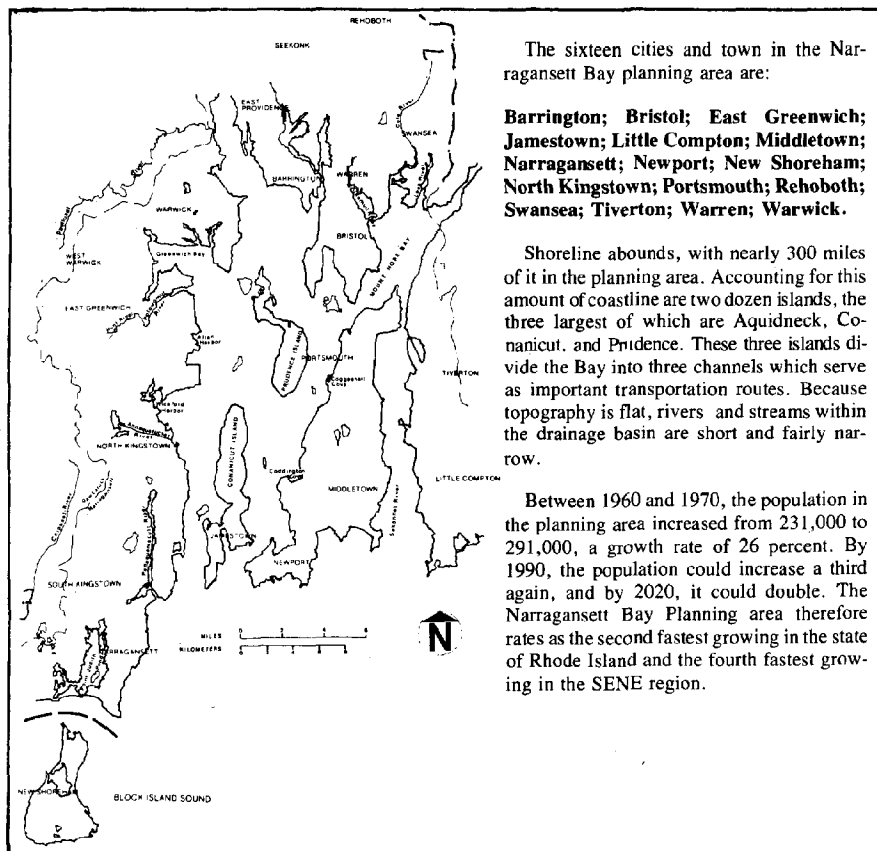
A number of structures have been suggested to reduce flood damages—dikes and walls, diversions and dams—but none of them appear to be able to control the most serious flood problem: the combination of riverine and tidal flooding. The SENE Study, while awaiting the results of detailed study by the Corps of Engineers, suggests that the only long-term solution is the flood proofing of threatened buildings and the regulation, through flood plain zoning and other measures, of further en-

croachment on flood plains and wetlands. It will never be feasible or possible to completely protect development in flood plains from all future flood events.

Meeting Outdoor Recreation Needs

By the time the Big River Reservoir is developed, public water agencies will own more than enough land to meet the demand for certain outdoor recreation activities. The problem is that, while not strictly illegal, reservoir lands are seldom accessible to the public for any purpose. There is persuasive evidence, however, that light recreation activities—hiking and nature study, for example—would have little effect on the purity of drinking water if permitted on storage reservoir lands. The SENE Study recommends, therefore, that the Rhode Island Department of Natural Resources work with water and public health authorities to develop guidelines for light recreational activities on storage reservoirs. Also recommended are expansion of facilities at John Curran State Park, a regional trails system, and increased public access to a number of ponds and streams.

9. Narragansett Bay



The sixteen cities and town in the Narragansett Bay planning area are:

Barrington; Bristol; East Greenwich; Jamestown; Little Compton; Middletown; Narragansett; Newport; New Shoreham; North Kingstown; Portsmouth; Rehoboth; Swansea; Tiverton; Warren; Warwick.

Shoreline abounds, with nearly 300 miles of it in the planning area. Accounting for this amount of coastline are two dozen islands, the three largest of which are Aquidneck, Conanicut, and Prudence. These three islands divide the Bay into three channels which serve as important transportation routes. Because topography is flat, rivers and streams within the drainage basin are short and fairly narrow.

Between 1960 and 1970, the population in the planning area increased from 231,000 to 291,000, a growth rate of 26 percent. By 1990, the population could increase a third again, and by 2020, it could double. The Narragansett Bay Planning area therefore rates as the second fastest growing in the state of Rhode Island and the fourth fastest growing in the SENE region.

The most attractive quality of the Narragansett Bay area is its ability to accommodate a wide variety of human endeavors. The Bay area is one of the most outstanding recreation attractions in the east, it is home to a large and thriving commercial fishing industry, supports a large amount of heavy industry and provides for the overflow residential needs of many of Rhode Island's major urban centers. The challenge for the future is maintaining balance in this variety, ensuring that none of these users of the Bay's resources overpowers the others, thereby endangering the quality of life.

Rapid Urbanization

Between 1960 and 1970 the face of the Narragansett Bay area changed considerably as the amount of urban lands grew by nearly 90 percent. Most of this growth was at the expense of the area's agricultural land—as much as 25 percent of the farmland in the area was lost in the sixties. Despite this rapid development, the planning area still has the highest proportion of agricultural lands in all of Southeastern New England.

According to SENE Study calculations, enough developable land exists in the Bay area

to meet growth needs through 1990. Soon after that, however, the area will be in a bind, unless development densities are increased to reduce the rate of land consumption—or land critical to water supplies, recreation, and flood control are sacrificed.

Seizing Recreational Opportunities

The Bay area has traditionally served the recreational needs not only of its own residents but those of other parts of the state and parts of Massachusetts as well. As those areas have mushroomed, recreational demands have increased but, for the most part, opportunities have not. These unmet needs are particularly critical in the Providence metropolitan area. One of the most outstanding opportunities for meeting some of these needs is right at Providence's doorstep: the remaining undeveloped islands in Narragansett Bay. The SENE Study urges the state to give highest priority to development of the Narragansett Bay Islands Park system. The state plan includes Patience and parts of Prudence Islands, Dutch, Despair, and Gooseberry Islands, and the northern end of Conanicut and Hope Islands at some later date. Proposed are a wide range of recreational ac-

tivities and facilities, from light to intensive, and the provision of easily affordable public water-borne transportation to the islands from upper Bay metropolitan areas.

Providing for Industrial Development

The closing of government military installations on the Bay has slowed the area's growth considerably and crippled its economy. Local and state officials are searching for new development, with particular emphasis on support industries for offshore oil and gas development. The Study urges the state to identify, and secure, suitable sites for heavy industrial development and to set standards for such development which would ensure compatibility with the recreational and commercial fishing uses of the Bay.

The Combined Sewers Problem

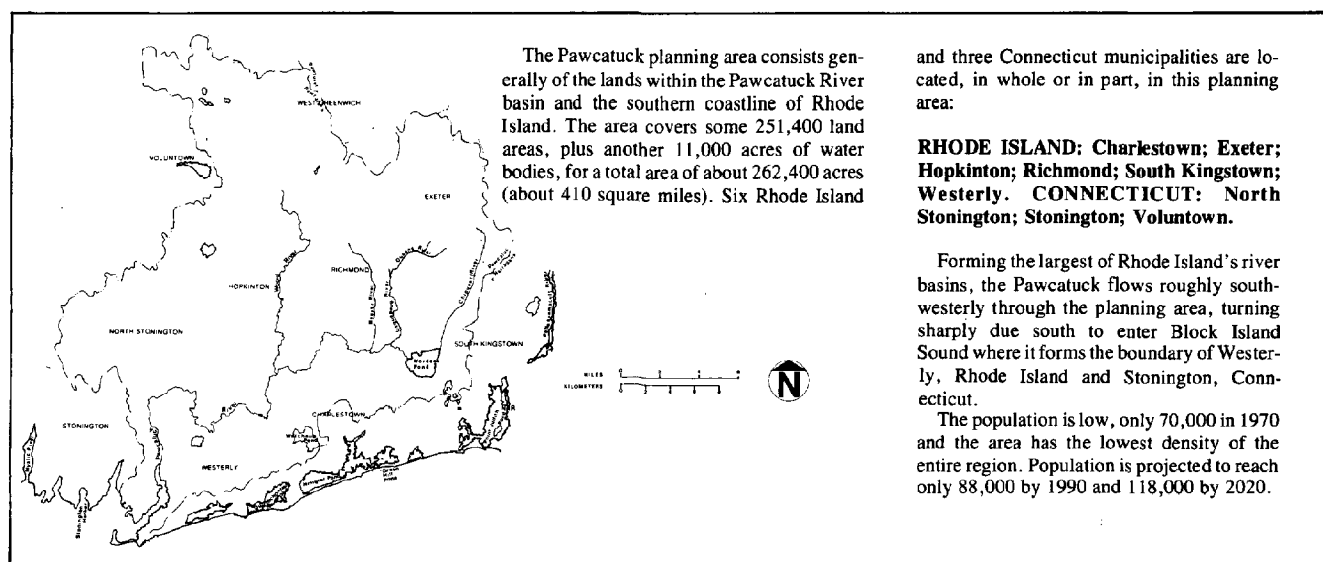
One of the most serious and persistent problems affecting the Bay is the heavy pollution loading from densely developed areas on the Upper Bay. Municipal discharges, industrial effluents, and polluted tributary streams all contribute to the acute water quality problem in the Bay, but the worst offenders are combined stormwater and sanitary sewer systems in Providence and Pawtucket. When rainfall in a 24-hour period amounts to one-half inch or more, a significant portion of the Upper Bay is closed to shellfishing for a week or more because of the combined discharge of untreated wastewater and stormwater. To a lesser extent Newport, Jamestown, and Bristol have the same problem. The State is working hard to cope with these discharges. The SENE Study endorses the State program and urges treatment of the combined discharges and partial separation of storm and wastewater systems in Pawtucket.

Drinking Water for the Islands

The closing of government military installations on the Bay has lessened the need for new water supplies in some communities which had appeared to be facing a crisis. Rhode Island's Statewide Planning Program now projects that it will take until 1990 for water demands to again reach what they were in 1970 in Portsmouth, Middletown, Newport, and Jamestown. As a result, the SENE Study finds that the proposed Big River Reservoir will be able to provide sufficient supplies to meet the needs of these communities after 1990.

Ground water from the Pawcatuck planning area is another source contemplated for supplementing these four communities' supplies. However, the possibility of new industrial development means that water demands may suddenly raise sharply. Therefore, the Study recommends the additional information about Pawcatuck ground water be made available in case a decision to export it to the Islands becomes necessary.

10. Pawcatuck



The Pawcatuck planning area is the most thinly populated portion of the SENE region. Most of the population of 70,000 is split between South Kingstown on the east and Westerly and Stonington on the west. It is the most rural and forested of all the SENE planning areas, and the people in the area's nine towns like it that way.

An Important Playground

A lot of people visit this area's vast and beautiful barrier beaches in the summer. They converge down from Providence, Worcester, Connecticut and New York, but even on the hottest summer days the most popular beaches are seldom overcrowded. Local management and protection of some of these areas for general public use has been highly successful in some cases. Nevertheless, enough people tramp over the dunes to cause significant damage and preserving the barrier beaches from erosion is a critical problem. If management problems should get completely out of hand, the Study encourages some appropriate form of state assistance.

The South coast in general, and the Pawcatuck River in particular comprise one of the most significant boating areas in the entire region. Marina space is becoming short, however, and the Study suggests steps which should be taken to accommodate boating demands in the future without changing the existing environmental quality.

Protecting the Flood "Barriers"

In the intervening years since the last major hurricane, a lot of people seem to have forgotten that the barrier beach refers to an ability to fend off the destructive tides, waves, and wind.

The residential development which has occurred in barrier beach areas not only exposed itself to damage, but by destroying the beaches, exposes others previously protected.

Despite regulations against such development issued by the Rhode Island Coastal Resources Management Council, special local exceptions, plus to some degree, the availability of federally-sponsored flood insurance have, in effect, encouraged continuing construction in these high risk areas. However, the opinion of experts is that federally-supported hurricane protection works cannot be justified. In many areas the barrier beaches are the only protection available. The Study outlines a number of measures designed to control the uses of flood-prone lands and protect those beaches, salt marshes, inland wetlands, and flood plains which naturally reduce flood stages.

A Wealth of Water Sources

The Pawcatuck area is rich in water as well as beaches. Its ground water resources are among the most abundant in the region, and while some will have to be developed to meet local needs in the future, still more may be needed for other parts of Rhode Island which find themselves water-short.

The Rhode Island Water Resources Board is considering the development of Pawcatuck ground water to supplement the existing surface water supplies of four lower Narragansett Bay communities (Portsmouth, Middleton, Newport, and Jamestown). There are a number of problems which would have to be overcome, however, including the need to maintain minimum flows in the area's streams, depletion of other wells, treatment for manganese, and a price tag of \$19 million (1974 dollars) for

pipeline construction to Aquidneck Island. Since the closing of the Navy Base on the island, however, water demands have dropped sharply, and the Statewide Planning Program projects they will not return to pre-1973 levels until some time after 1990. With the possibility of new industrial development on the island, however, the SENE Study recommends that the U.S. Geological Survey conduct data collection studies, so that the Water Resources Board has the information it needs, should a decision to export Pawcatuck ground water become necessary.

Another water development project under consideration in the planning area is the Wood River Reservoir. This project will not be necessary, according to SENE Study calculation. Construction of the Big River Reservoir would provide adequate water for Jamestown, Portsmouth, Middletown, and Newport after 1990 when additional sources are needed. The Study's assessment is that with full development of local sources of supply and the Big River Reservoir, the Wood River project will not be necessary until after 1990, when other sources of supply may be more economical to develop. Instead, the Study recommends that the state enact scenic rivers legislation, along the lines of the Massachusetts statute, to protect stretches of the Wood River, as well as the Pawcatuck and Beaver Rivers for limited recreational use.

The SENE Study: What It Is And How To Use It

If you have read this far you deserve a useful recap. Stepping back from the details of the Study's recommendations, then, just what is the SENE Study? How is it useful? Who should use it and what actions should they take?

What The SENE Study is

1. *It is a Planning Tool.* It is an objective description and display of the development capabilities and limitations of the natural resources of eastern Massachusetts and Rhode Island. In many ways it is the start toward state development policies and plans, at least from a natural resources point of view.
2. *It is a Guide for Future Development.* Not a blueprint, but a guide. A balanced and integrated program of actions for managing, developing, protecting, and

conserving our natural resources. Not a completed picture of what the future should look like, but a series of steps which must be taken to set the future in motion.

How The SENE Study Is Useful

1. *It can be used to set priorities for action* by the states or the federal government in their programs to improve the management of our resources.
2. *It can be used to evaluate the plans, projects, and actions of others.* Since it is the only common frame of reference about Southeastern New England's resources, it can be used so that we can know the effects of the development proposals of others before it is too late.

Who Should Use The Study

The SENE Study can be useful at many levels. But to begin to implement its recommendations, commitment is needed at the highest level. Establishing this commitment will probably require an *Executive Order* from each Governor calling attention to the Study and requiring individual state resource agencies to adopt relevant portions as state policy. Or the Governor could simply call a meeting of appropriate Cabinet members to work through the details of the Study and determine how well it meets state goals, perhaps using Study findings and recommendations as a point of reference. The following chart suggests how various levels of government might use the Study and what action they might take.

| Who Could Use It | How It Could Be Used At the State Level | Action To Implement It |
|--|--|---|
| <i>Governor</i> | As support for economic and environmental policies | <i>Issue Executive Order requiring state agencies to use it</i> |
| <i>Mass. Cabinet and Rhode Island State Planning Council</i> | Identify ways to integrate social, economic, and environmental objectives | <i>Review and adopt, where appropriate, SENE Study policy recommendations</i> |
| <i>Individual Department Secretaries</i> | To initiate and evaluate agency programs, review proposals, and identify opportunities for co-operation among agencies | <i>Enforcing Governor's Executive Order issuing program directives</i> |
| <i>Subordinate Agency Heads</i> | To develop resource management programs and set priorities | <i>Carrying out Governor's Executive Order in day-to-day activities</i> |
| <i>Legislative</i> | As basis for land use legislation, reviewing funding proposals, and making appropriations | <i>Enact laws and appropriate funds</i> |
| <i>Regional Planning Agencies</i> | At the Regional Level As a planning guide; siting guide; and checklist for review of development and project proposals | <i>Review and adopt geographically appropriate portions of Study; use as reference</i> |
| <i>City and Town Planning Boards</i> | At the Local Level As a basis for revising zoning, subdivision regulations, or other land use controls | <i>Adopt relevant policies and recommendations of Study; use them as basis for local action</i> |
| <i>Conservation Commissions</i> | To select appropriate lands for acquisition; to review development proposals | <i>Adopt relevant policies and recommendations of Study; use them as basis for local action</i> |
| <i>Economic Development Commissions</i> | To identify land appropriate for industrial development; show attractiveness for economic development | <i>Adopt relevant policies and recommendations of Study; use them as basis for local action</i> |
| <i>Interested Citizens</i> | As a starting point for voicing needs and as a basis for lobbying efforts | <i>Voting referenda and as educational tool.</i> |
| <i>Congress and Federal Agencies</i> | At the Federal Level As a framework for funding; and for project and program evaluation | <i>Take official action and refer to it in making appropriations and developing legislation</i> |

SUMMARY ENVIRONMENTAL STATEMENT

Southeastern New England Water and Related Land Resources Study

[] Draft [X] Final

Responsible Agency:

U.S. Water Resources Council

New England River Basins Commission

For Additional Information Contact:

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New England River Basins Commission

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Warren D. Fairchild

U.S. Water Resources Council

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Washington, D.C. 20037

202-254-6442

1. **Name of Action** (X) Administrative.
() Legislative
2. **Brief Description of Action.** The New England River Basins Commission is submitting to the U.S. Water Resources Council, for transmittal to the President and by him to the Congress, a report recommending policies and actions for balanced conservation, management, and development of the water and related land resources of Southeastern New England. The report contains a series of policies and structural and non-structural solutions in the following areas: water supply, water quality, land use, outdoor recreation, sport fisheries and wildlife, offshore fishing, port development, dredged materials disposal, urban waterfront use, sand and gravel extraction, flooding and erosion, electrical power, petroleum facilities, and solid waste management. Actions are directed to all levels of government and private interests for eastern Massachusetts, all of Rhode Island, and three municipalities in southeastern Connecticut.
3. **Summary of environmental impact and adverse environmental effects.**
Environmental Impact. Study objectives, as outlined in the *Principles and Standards* of the U.S. Water Resources Council, were to enhance environmental quality and national economic efficiency. In sum, the recommended policies and actions which make up the SENE program can result in a significant net benefit to the environment of Southeastern New England. The Study's lead recommendation is to *increase protection of critical environmental areas*. Such action will directly benefit (i) water supply by protecting well sites and wetlands; (ii)

outdoor recreation by protecting beaches and wetlands; (iii) marine management by protecting wetlands, estuaries, and shellfish areas; and (iv) flooding and erosion by protecting wetlands, flood plains, beaches, and critical coastal erosion areas. The Study's second lead recommendation—*manage areas suitable for development*—will not only reinforce protection of critical environmental areas, but will also decrease the cost of development by guiding growth to lands which can support development, and within those lands to areas already served by essential water, sewer, and transportation services.

Adverse Environmental Effects. Net environmental benefits of the recommendations are expected to be strongly positive. Environmental impacts were considered as part of the planning process throughout the Study in order to eliminate adverse or irretrievable impacts and to actively enhance environmental quality wherever possible.

One of the 128 recommendations—to develop state programs regulating mineral extraction activities in coastal waters—appears to have a net negative effect on the planning objective for providing unwelcome facilities. However, the recommendation was formulated to avoid adverse environmental effects that near-shore mining is expected to cause on shellfish beds, delicate spawning grounds, and the delicate natural equilibrium maintaining the natural contours of existing beaches.

4. **Summary of Major Alternatives Considered.** A number of alternatives were proposed and evaluated for each of over 15

subject areas of study and for each of the 10 geographic planning areas in the Southeastern New England region. These alternatives, which included no-action options, ranged from a non-structural, non-regulatory approach to various levels of development. Formulated to meet expected needs for water and related land resources, these alternatives are *summarized* in the environmental statement. In many cases, elements of the alternatives were combined to form the recommended policies and actions.

5. **Comments** and views have been requested from the Governors and key agencies in Massachusetts, Rhode Island, and Connecticut, as well as Maine, New Hampshire, Vermont, and New York; the head of each federal department or agency and each interstate agency which has a representative to the New England River Basins Commission, as well as appropriate federal agency offices listed in Appendix III of the NEPA guidelines. Copies of the complete report and Environmental Statement were received from the Department of Agriculture, Department of the Interior, Department of Commerce, Environmental Protection Agency, and the Federal Power Commission. Considerably more agencies and individuals received and commented on the full Study reports. Their comments and changes made in response to them are included in the chapter, Review of the Reports.
6. **Draft Statement to CEQ: May 5, 1975.**
Final Statement to CEQ [To be submitted by the U.S. Water Resources Council at the time of transmittal to the President and the Congress.]

Representatives of Contributing State And Federal Agencies

FEDERAL—STATE

New England River Basins Commission

R. Frank Gregg, Chairman**; Robert D. Brown, Staff Director**; Robert Kasvinsky, Study Manager*; Jane F. Carlson; Cornelia V. H. Ferber; Alan Jacobs; Ernesta Kracke; James Luty; William Mahoney; Priscilla Newbury; William E. Nothdurft; William E. Richardson; Philip Tabas.

New England Regional Commission

Thomas Fitzpatrick**; Tirath Gupta* (consultant); Robert Bogen*.

MASSACHUSETTS

Executive Office of Environmental Affairs

Dr. Evelyn Murphy, Secretary**

Coastal Zone Management Program

Matthew Connolly**; Dan Calano*.

Department of Environmental Management (formerly Department of Natural Resources)

Arthur W. Brownell, Commissioner** (to February 1975); Dr. Bette Woody, Commissioner** (as of June 1975).

Division of Water Resources: Charles Kennedy**; Emerson Chandler* (as of June 1974); Clinton Watson* (to June 1974).

Water Resources Commission: Robert E. Lautzenheiser.

Department of Community Affairs

Lewis S. W. Crampton, Commissioner** (to February 1975); David Terry*.

Resources Management Policy Council

Vincent Ciampa.

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Division of Environmental Health (formerly Department of Public Health): George Coogan.

Division of Water Pollution Control: Tom MacMahon**; Dick Young*; Al Cooperman*.

RHODE ISLAND

Rhode Island Statewide Planning Program

Daniel W. Varin, Chief**; Patrick V. Fingliss*; Lou David.

Coastal Zone Management Program

Coastal Resources Management Council:

John Lyons, Chairman.

Coastal Resources Center: Stuart O. Hale; Malcolm Grant.

Water Resources Board: Robert Russ**; Peter Calese*.

CONNECTICUT

Department of Environmental Protection

Joseph Gill, Commissioner**; Robert B. Taylor, Director* of Water Compliance.

FEDERAL

Department of Agriculture

Soil Conservation Service: Dr. Benjamin Isgur**; Philip H. Christensen**; Stephen Claughton*.

Economic Research Service: John Green*.

Forest Service: Kenneth Johnson**; Sam Becker* (to December 1973); Neil Lamson* (to March 1974); Douglas Monteith* (as of March 1974).

Department of Commerce

National Weather Service: Norman L. Canfield** (to September 1975); Albert Kachic**; Joseph J. Brumbak.

National Marine Fisheries Services: Russell T. Norriss**; Christopher Mantzaris*.

Bureau of Economic Analysis: Henry DeGraff; Gene Janisch.

Maritime Administration: William S. Chambers**; Robert L. Safarik.

Department of Defense, Department of the Army, Corps of Engineers

Planning Division: Joseph Ignazio, Chief** (to June 1974).

Policy and Long Range Planning Branch: Lawrence Bergen, Chief**; (As of June 1974); John Landall*; Gardner Blodgett*; Paul Pronovost.

Plan Formulation Branch: Steven Onysko

Coastal Development Branch: Harvey Minsky

Department of Housing and Urban Development

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Department of Transportation

Federal Highway Administration: Stanley R. Davis**; Charles L. O'Donnell** (to October 1975).

U.S. Coast Guard: Capt. Bernard Thompson* (to October 1973); Capt. Alvin P. Durgin, Jr.* (October 1973 to August 1974); Cdr. C. R. Lindquist* (to February 1974); Capt. Royal E. Grover, Jr.* (as of August 1974); Rear Admiral James P. Stewart** (as of October 1975).

Environmental Protection Agency

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Water Supply Branch: Jerome Healey*; Stephen Lathrop*; Alma Rojas* (to February 1974).

Department of the Interior

Roger Sumner Babb** (as of December 1974); Mark Abelson** (to June 1973); Kenneth Young** (to May 1974); William Patterson** (as of September 1974); Robert B. Ryder* (as of May 1975).

Bureau of Mines: Robert D. Thompson*; Joseph Krickich* (to March 1974); Peter Morey* (as of March 1974).

Bureau of Outdoor Recreation: James Donoghue* (to March 1973); Eric Finstick* (to September 1974); Alan Hutchings* (as of September 1974); Earl Nichols (as of September 1974).

Fish and Wildlife Service: Melvin Evans**; Roy Landstrom*; Dewey Castor; Dave Ferguson; Fred Benson; Tom Oliver.

National Park Service: David Clark**; David Kimball; Richard Giamberdine.

University of Massachusetts (consultants for NPS): Ervin Zube; Julius Gy Fabos; R. Jeffrey Riotte*.

U.S. Geological Survey: Michael Frimpter*

Federal Power Commission

Martin Inwald*; Jonas Barish*.

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Old Colony Planning Council

Daniel Crane; Robert McMahon.

Cape Cod Planning and Economic Development Commission

Robert Robes; Paul Doane.

Dukes County Planning and Economic Development Commission

Robert Komives.

Nantucket Planning and Economic Development Commission

William R. Klein.

Central Massachusetts Regional Planning Commission

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Southeastern Regional Planning and Economic Development District

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Southeastern Connecticut Regional Planning Agency

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Legal and Institutional Analysis

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Planning Analysis

William V. McGuinness, Jr.; Robert Gidez and Paul Merkens, Intasa; Harry Schwartz.

Public Participation

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Report Preparation

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